Tomas Bata University in Zlín

Science Activity Annual Report

2014

CONTENT

1 DEFENDED DOCTORAL THESES

In 2014, a total of 39 theses were defended: 20 at the Faculty of Technology, 18 at the Faculty of Management and Economics and 1 at the Faculty of Applied Informatics.

1.1 Faculty of Technology

Degree Programme: CHEMISTRY AND MATERIALS TECHNOLOGY

Degree Course: Technology of Macromolecular Compounds

Ing. **Pavel Bažant**, Ph.D.

Date of defence: 28. 8. 2014

Supervisor: doc. Ing. et Ing. Kuřitka Ivo, Ph.D. et Ph.D.

Preparation and Properties of Composite Materials for Potential Medical and Sanitary Application

Abstract

The presented doctoral thesis is submitted in the form of a commented thematically arranged collection of three original scientific articles and one utility model underpinned by the theoretical background. The work is oriented on the original preparation method of polymer composite materials with antibacterial micro- and nano-particulate fillers immobilized on the surface of carriers of natural origin. Novel method for preparation of hierarchical nanostructured hybrid fillers decorations on surface of biocompatible carriers such as cellulose and wood flour by microwave assisted solvothermal synthesis was developed. These fillers were immobilized on surface of carriers in order to decrease the risk of toxicity of nanoparticles during processing and application, to improve compounding with polymers and to reduce the amount of active species while their important properties such as size and specific surface area were kept on the same level. Morphology of prepared filler was controlled by the addition of hexamethylenetetramine as the reduction and precipitation agent. Reaction mechanisms and factors influencing the synthesis of fillers were studied as well. Moreover, the effect of addition of ammonia, serving as secondary precipitation agent, on the growth of secondary crystal structure of nanoparticles was investigated and it was correlated with resulting change of antibacterial activity of

prepared composites. Higher reactivity of cellulose surface carriers and thus better immobilization of nanoparticles on their surface was provided by hydrogen peroxide treatment prior microwave assisted synthesis. Experimental methods used for analysis of prepared fillers included X-ray diffractometry (XRD), scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS). Medical grade polyvinyl chloride was selected as a model matrix for the preparation of composite and synthesized filler was added in amount of 5 wt. %. Selected polymer has good processability and therefore is an ideal matrix for demonstration of antibacterial activity of fillers. Prepared composite systems manifested relatively weak adhesion of filler to matrix. Therefore, release of particles from the material was tested and confirmed sufficient adhesion. Antibacterial surface activity of composite materials was characterized according to ISO standard 221296:2007 (E) against E. coli as representative gram-negative bacteria and against S. aureus as representative gram-positive bacteria. Moreover, these bacteria are responsible for the most of nosocomial infections. Furthermore, electrical conductivity and dielectric properties of prepared composite materials were studied as well, as the prospective medical device made of this material shall not interfere undesirably with the diagnostic and therapeutic electronic apparatuses used in medicine. The third research paper included into the thesis describes possible links to origin of the synergy between silver and ZnO in antibacterial effectivity observed recently. This paper include analyses elucidating the true hybrid character of Ag/ZnO particles (it is nod silver doping to ZnO) and interaction of precursors of these particles with substrate surface, and moreover, the collective plasmon resonance on neighbouring aggregated silver nanoparticles, which was previously well-known from optical studies only, was firstly observed here by XPS.

Ing. **Zuzana Dujková**, Ph.D.

Date of defence: 25. 7. 2014

Supervisor: doc. Ing. Dagmar Měřínská, Ph.D.

Polystyrene/clay Nanocomposites

Abstract

Plastics are very commonly used materials nowadays. Their consumption is growing every year. The main trend is developing materials with new and better properties for usage. Styrene plastics are among the most commonly used polymers, therefore the improvement of the prope-

rties is concerned with them as well. One possibility for modification of plastics properties is the usage of fillers. Research and development have long been moving towards nanofillers, i.e. fillers with particle sizes in the nanometer range. The focus is on layered clay nanofillers, since if the sufficient dispersion in a polymer matrix is reached, they have a significant effect on the material properties even in a small loading. The presented work deals with layered clay nanofillers in the matrix of styrene plastics, particularly polystyrene and high impact polystyrene. Unmodified and modified commercially available clays were used, but in some parts of the research for comparison purposes other fillers with a different shape of particles were additionally used. The dispersion of fillers in the polymer matrix was evaluated, along with mechanical and barrier properties, fire retardation or photodegradation. The important results achieved are the confirmation of the positive effect of compatibilizers on the dispersion of clay nanofillers or the proving of a synergic effect on fire retardation of conventional fire retardant and the clay nanofiller. One of the results of the dynamic mechanical analysis was the evaluation of higher glass transition temperature of filled samples in comparison with the pure matrix. The results also showed that the chosen fillers can reduce the impact of photodegradation.

Ing. **Lenka Gřundělová**, Ph.D.

Date of defence: 28. 8. 2014

Supervisor: doc. Mgr. Aleš Mráček, Ph.D.

The Stability of Hyaluronan's Behaviour in Solutions for the Technology of Pharmaceutical Products

Abstract

Ph.D. thesis "The stability of hyaluronan's behaviour in solutions for the technology of pharmaceutical products" is in the first part focused on the description of the hyaluronic acid structure, it's solution behaviour and properties, which are essential for understanding of the studied problematics. The next part deals with characterization of surfactants, including their classification, followed terms which are closely related to surfactants, such as critical micelle concentration or polymer-surfactant interaction. The next chapter of the theoretical part provides a basic description of Hofmeister series salts and their classification, which is accompanied by a description of Hofmeister interactions. The basic theoretical background of utilized characterization methods, including their brief description and evaluation is also provided. These met-

hods were chosen in order to contribute to clarification of physico-chemical properties and solution behaviour of hyaluronic acid. Experimental part of the thesis is divided into three parts, the first part is dealing with the influence of quarternary salt on hyaluronan conformation and particle size in solution, the nex tis dealing with behavior of hyaluronan in solutions with salts of the Hofmeister series, and finaly the third part is aimed at viscoelastic properties of hyaluronan films and hydrogels modified by carbodiimide.

Ing. **Lucie Husárová**, Ph.D.

Date of defence: 12. 6. 2014

Supervisor: doc. Mgr. Marek Koutný, Ph.D.

Study of Polymer Material Biodegradation by Combination of Conventional and Molecular Biology Methods

Abstract

The thesis studied selected polymeric materials and their biodegradation using methods based on material characterization of polymers, gas production during biodegradation process and selected molecular biology methods. Biodegradability of prepared polyethylene samples with various prooxidants previously subjected to abiotic oxidation were studied in the environment of soil and compost. Further research was focused on the introduction of selected molecular biology methods in the laboratory of the faculty, especially gel electrophoresis in the temperature gradient (TGGE). This separation technique was optimized along with related procedures such as nucleic acid isolation, polymerase chain reaction (PCR), evaluation of TGGE gels, cloning and preparation of DNA samples for sequencing. Biodegradation of polyvinyl alcohol (PVA) under denitrifying conditions in an activated sludge was also investigated subsequently with the dynamics and composition of the microbial communities involved in the biodegradation of polylactic acid (PLA), depending on its form and the molecular weight distribution. These experiments were conducted in the compost. In these experiments, the selected molecular methods were applied to identify the microorganisms responsible for the degradation of polymers.

Ing. **Jakub Kadlčák**, Ph.D.

Date of defence: 28. 8. 2014

Supervisor: doc. Ing. Roman Čermák, Ph.D.

Filler Dispersion and Rheology of Polymers

Abstract

This monograph deals with the topic of carbon black behaviour in rubbers and aspects influencing this. The first part of the monograph is dedicated to the state of the art where theoretical background for the doctoral work is reviewed. At first, a brief introduction to rubber compounding is given and the most important ingredients in rubber compounds are described. One of the most important ingredients is carbon black thus its production, properties, its dispersion and general role in rubber compounds are described thoroughly. Methods for the evaluation of carbon black properties are introduced with the special focus on the carbon black structure evaluation. Furthermore, the topic of carbon black dispersion process is reviewed together with methods for the evaluation of filler dispersion quality. The filler dispersion quality is mainly given by the efficiency of mixing process. The mixing process and its stages are explained mentioning aspects influencing each stage. The special focus is given to post-mixing stages when dispersed filler due to ubiquitous physical forces tends to reagglomerate which can result in formation of filler network. This process has strong influence on the filler dispersion quality. Therefore, it is of high importance to monitor this process. The state of the art is followed by the section devoted to the experimental work. The experimental work was divided into three main topics. The first one deals with the carbon black structure examined by mechanical compression. The second topic deals with the evaluation of quality of carbon black macrodispersion. The last topic which is the most extended area of this work is dedicated to the carbon black behaviour in rubbers and its interrelation to the processing and the material aspects.

Ing. **Zuzana Kožáková**, Ph.D.

Date of defence: 24. 6. 2014

Supervisor: doc. Ing. et Ing. Ivo Kuřitka, Ph.D. et Ph.D.

Tailoring of Magnetic Fillers for Polymer Composites and Suspensions

Abstract

The presented doctoral thesis is submitted in the form of commented thematically arranged collection of five original scientific articles underpinned by the theoretical background. Synthetic techniques of magnetic particles preparation, their basic features and properties are overviewed with emphasis on the possible application and present trends in many areas are included, too. At first, original method for the preparation of magnetic nanoparticles based on the iron oxides by the use of microwave-assisted solvothermal techniques is introduced. Mechanisms that take place within this synthesis are also elucidated here. On the basis of discovered mechanisms, we also propose the manner of tailoring of the particles via the precise control of synthesis parameters. Magnetic particles composed of magnetite/maghemite were prepared in 30 minutes while the conventional solvothermal techniques take usually 12-24 hours. Particles size (20-120 nm), shape and organization (single crystal polyhedral particles, polycrystalline spherical assemblies) and presence of crystalline impurities (presence of hematite, goethite and others) were influenced via the selection of the synthetic parameters. The crystalline composition of these particles was determined by the X-ray diffraction, morphology and particle size distribution were investigated with the help of scanning and transmission electron microscopy. Magnetic properties were measured via the vibrating sample magnetometry and the frequency dependent measurement of complex magnetic permeability. It is well known that for the mesoscopic and nanoscopic materials, contribution of surface and interface atoms to the magnetic anisotropy is great and thus the magnetic behavior is strongly dependent on the dimension of particles. For this reason, the correlation between the synthesis parameters, structure and morphology of obtained products and the magnetic properties was also discussed. In order to obtain elongated shape of the magnetic particles that are suitable for the use in magnetorheological suspensions, another method utilizing decomposition of unstable precursor under the elevated temperature was also proposed. It is a two-step process: first step involves solvothermal synthesis of the precursor with the elongated shape, which is, in the second step decomposed into the iron oxide particles that preserve the shape of the precursor. Both steps involve microwaves instead of common heating and thus the process is fast and highly effective. The performance of prepared nano-particulate systems was demonstrated in magnetorheological experiments as well as by in vitro calorimetry for prospectiveapplication in hyperthermia.

Ing. **Ondřej Krejčí**, Ph.D.

Date of defence: 17. 6. 2014

Supervisor: doc. Ing. Pavel Mokrejš, Ph.D.

Keratin Waste Treatment and Application Possibilities of Reduced Forms of Keratin

Abstract

This thesis deals with preparation of keratin hydrolysates from waste sheep wool, characterization of these hydrolysates and their application possibilities. A method of alkali-enzymatic hydrolysis was developed and optimized for preparation of keratin hydrolysates, where in a first step wool was hydrolysed in a low-concentrated alkali solution and in a second step a proteolytic enzyme was added. Hydrolysis experiments were planned and evaluated by statistical factorial test and influence of chosen hydrolysis factors on effectivity of hydrolysis was observed. High efficiency of hydrolysis (almost 75 % of decomposed wool) was reached in experiment, where wool was treated in 0.6% KOH at 90°C for 48 hours in first step and 5 % enzyme Savinase 6.0T addition at 60°C for 24 hours in second step. Concentration of alkali solution has high influence to amount of decomposed wool. Molar weight of prepared keratin hydrolysates was mostly between 15-50 kDa, but in some experiments fractions with molar weight more than 100 kDa were found. Composition of hydrolysates was a little different in comparison with wool, especially in sulphur and ash content, but amount of nitrogen was almost unchanged. A reduction of ash content to acceptable 5 % in prepared keratin hydrolysates was achieved by a dialysis. A stock amount of the keratin hydrolysate was produced according to optimized conditions of alkali-enzymatic hydrolysis. The application potential of prepared keratin hydrolysates was tested for three chosen types of utilization. The fist utilization was a film preparation from the keratin hydrolysate with additives (plasticizer, cross-linking agent) and testing their physical-mechanical properties and composition. Properties of films with 30 % addition of the glycerol and cross-linked by the glutaraldehyde had the most optimal properties. In the second utilization composite desks from two types of PE with 5 or 10 % of hydrolysate addition were prepared. Mechanical and thermal properties of composite desks weren't negatively affected by hydrolysate. Addition of the keratin hydrolysate into PE led to decrease of crystallinity and elongation. The last utilization was testing the keratin hydrolysate as a carrier of active substances. The obtained active substance from prepared capsules was liberated gradually during a process of capsules dissolution.

Ing. **Pavel Kubík**, Ph.D.

Date of defence: 17.10.2014

Supervisor: doc. RNDr. Jiří Vlček, CSc.

Investigation of Polymer Melt Flow through Different Mixing Elements and Waving Screw Channels

Abstract

One of the most important, yet problematic, issues in the extrusion process is achieving good mixing. A revelation of its principles inside of various types of mixing elements is always appreciated. So, an enormous effort was spent to study mixing principles not even by setting some experiments but also by 3D FEM simulation that allows to look at the mixing under the real processing conditions and its correlation with experimentaly obtained data is acceptable. At the beginning, the theoretical background focused on the extrusion process is presented. Specifications of all main zones in the single-screw extruder are shown. Basic mixing principles are also a part of the theoretical background. The biggest part of the theoretical background, however, is pointing to history of screw design and development of mixing elements. Some methods of mixing quantification are presented, as well. Then, the performance of three different mixing elements on color dispersion in polymer stream during extrusion is studied. Two similarly designed Maddock mixers and a Stratablend II mixer are used as the last part of a general purpose single screw. Moreover, an in-line melt camera is used for quantification of mixing quality by visualization of grayscale of the color dispersion and thus mixing. The Stratablend II mixer produces the lowest and most uniform standard deviation. Comparison with 3D FEM simulations clearly indicate that the Stratablend II mixer has the best mixing abilities and that these are mainly given by its unique design with high average value of shear stress. The results also suggest that the key factor for achieving better mixing is the frequency by which a large fraction of the material passes through the high shear stress regions of the mixer. A new average stress criterion is developed for a purpose of its quantification. The next step is studying of a mixing efficiency of two slightly different fluted mixing elements by RGB spectral analysis. This method is used for the quantification of the speed of mixing, but the overall mixing appears to be equal after sufficient mixing time. The fluted mixer without the wiping flight, however, creates a stagnation layer of material which rotates between the mixer and the barrel. This layer is characterized by a long residence time. The long residence time is again measured by RGB spectral analysis and also visualized in the video. Finally, a detail 3D FEM study by using

two different rheological models, of the mixing performance of the Fusion screw geometry is presented. Special criteria characterizing the mixing performance in dependence of the barrier undercut separating the waving channels are developed. A great mixing performance is achieved when a right balance in both dispersive and distributive part of the mixing process is found.

Ing. **Zdenka Kuceková**, Ph.D.

Date of defence: 27. 8. 2014

Supervisor: prof. Ing. Petr Sáha, CSc.

In Vitro Testing of Polyaniline Biological Properties

Abstract

Nowadays, interest in conducting polymers continues to increase. Polyaniline, due to its unique properties, possesses an important place among conducting polymers. The fact that several cell types and tissues are responsive to electrical fields and stimuli has made polyaniline attractive for a number of biological and medical applications. Any material used in biomedicine must have excellent properties in bulk as well as on the surface, because the surface comes into contact with living tissues first. Materials suitable for biomedical applications are generally those with surfaces that promote intended cell adhesion, proliferation, migration, and differentiation. Although polyaniline has been studied for many years, there has been only limited investigation of its biological properties. This work is therefore focused on a description of the biological properties of various polyaniline forms and their modifications. The cytotoxicity, hemocompatibility, and antibacterial activity of polyaniline are studied and summarized.

Ing. **Miroslav Pastorek**, Ph.D.

Date of defence: 28. 8. 2014

Supervisor: doc. Ing. Roman Čermák, Ph.D.

Crosslinking and Ageing of Ethylene-vinyl Silane Copolymers

Abstract

Nowadays, polyethylene is one of the most produced polymers due to its low price and useful properties. It is one of the oldest synthetic polymers and the development of its structure and

properties is closely connected with important discoveries in the field of polymer synthesis and modification. Crosslinking of polyethylene is a modification allowing significant improvement of thermal and mechanical properties that are necessary for advanced applications. Without crosslinking, polyethylene does not have sufficient thermal, mechanical and weather resistance required for the safety of products, such as wire insulation, hot water pipes and others. For this reason, research of crosslinked polyethylene is important, particularly the study of the influence of crosslinking performed at different conditions on the morphology, mechanical and thermal properties of the polymer. This work investigates the behavior and property evolution of ethylene-vinyl trimethoxysilane copolymers upon crosslinking and thermal ageing in the oven at two different temperatures. The influence of additives (crosslinking catalyst and antioxidant) and temperature on the chemical structure, morphology and mechanical properties was investigated. The silane crosslinked copolymers used in this work have properties similar to LDPE and is usually used for the production of cable insulation. It was found that two parallel processes influence the final properties: (1) crosslinking reactions and (2) improvement of crystalline order. These two processes play different role depending either the ageing proceed below melting temperature or above melting temperature. Chemical structure of EVTMS copolymers has an impact on molecular arrangement and changes of morphology due to melting and crosslinking then significantly influence the final mechanical properties. Behavior of EVTMS copolymers under these conditions can seriously affect the safety and durability of the products.

Ing. **Jakub Sedlák**, Ph.D.

Date of defence: 28. 8. 2014

Supervisor: doc. Ing. et Ing. Ivo Kuřitka, Ph.D. et Ph.D.

Multiscale Hierarchical ZnO-based Composite Systems

Abstract

The presented doctoral thesis, submitted in the form of a commented, thematically ordered collection of original scientific articles supported by theoretical background, is focused on the preparation of multiscale hierarchical ZnO-based composite systems. Several preparation techniques, including bottom-up as well as top-down methods were employed throughout the work aiming the synthesis of various nanocrystalline ZnO powders that demonstrated the application potential in diverse fields. In the first study, antibacterial ZnO filler was synthesized by solvo-

thermal microwave assisted process to obtain nanostructured hierarchical raspberry-like submicro particles. Their application potential was successfully confirmed with the preparation of an antibacterial composite made by mixing the prepared ZnO particles with medical-grage, softened poly(vinyl chloride) matrix, and with a final evaluation of the surface antibacterial properties. Methods leading to diverse ZnO morphologies were explored in a preliminary screening study that showed extreme versatility of the two-step synthesis (mechanochemical preparation of a precursor followed by microwave solvothermal synthesis). A follow up study was focused on desirable surface properties of ZnO nanostructured powders as ZnO is often utilized in oil or fat dispersions; the overall surface properties must be suitable for the intended application. Thus, the third study addressed to the preparation of surface-modified nanocrystalline ZnO particles with various lipophilicities and specific surface areas that were produced by a combination of mechanochemical preparation of precursor and subsequent solvo-thermal microwave-enhanced synthesis and coating in-situ. The last two investigations included in this thesis are associated with the synthesis of nanostructured porous ZnO powders by thermal annealing of zinc oxalate dihydrate and zinc peroxide precursor. The structural and morphological parameters of prepared mesoporous ZnO micro-beads and nanocrystalline assembled ZnO spheres were investigated. In addition, the application potential of the prepared ZnO powders was successfully demonstrated by testing the photocatalytic performance by UV degradation of methyl violet 2B. The formation mechanism of mesoporous ZnO micro-beads during annealing of zinc oxalate was identified and basic parameters of the sintering process and crystallite growth were described.

MSc. **Ilona Sergeevna Smolková**, Ph.D.

Date of defence: 18. 7. 2014

Supervisor: doc. Ing. Natalia E. Kazantseva, Ph.D.

Iron Oxide Nanoparticles and Polymer Composites on Thereof for Magnetic Hyperthermia

Abstract

Magnetic hyperthermia is a progressive method of non-surgical tumour treatment which demonstrated it's relevance in in-vitro and in-vivo studies; however, due to biological constraints on the amplitude (<= 15 kA m-1) and frequency (100 kHz - 1 MHz) of AC magnetic field,

magnetic materials with high value of specific loss power are required for clinical application in order to reach temperatures of 42 - 45 °C. Moreover the problem of uniform distribution and retention of magnetic material in the tumor has to be solved. The present doctoral thesis deals with preparation of iron oxide nanoparticles and polymer composites on thereof with a complex of magnetic, AC magnetic field energy absorption and rheological properties for the application in magnetic hyperthermia, particularly for the arterial embolization hyperthermia. Magnetic iron oxide nanoparticles were obtained by coprecipitation method in a controlled growth process leading to the formation of uniform and highly crystalline nanoparticles with repeatable magneto-structural properties. The material obtained represents a mixture of single-phase nanoparticles of magnetite and maghemite with nearly spherical shape. Though the size of nanoparticles corresponds to the single-domain state in the superparamagnetic regime, the material demonstrates ferromagnetic behavior due to strong magnetic interparticle interactions. Nanoparticles were annealed at 300 °C in air in order to ensure the stability of magnetic properties over time. The annealing of the particles does not change their size and shape, but transforms magnetite to maghemite. The dispersion of as-prepared and annealed nanoparticles in viscous glycerol medium shows the high heating rate in alternating magnetic field at moderate field amplitudes, the temperature increases from 37 °C to 45 °C in tens of seconds. The value of specific loss power is of 10 - 30 W.g-1 depending on nanoparticles concentration and field parameters. The feature of heat output is explained by the combined effect of magnetic interparticle interactions and the properties of the carrier medium. Ferromagnetic behavior of material accounts for the higher energy barrier for magnetization reversal leading to high magnetic losses. At the same time, low specific heat capacity of glycerol intensifies heat transfer in the magnetic dispersion. However, high viscosity of glycerol limits the specific loss power, since the Brown relaxation mechanism of AC magnetic field energy absorption is almost suppressed in this system. In the current doctoral thesis the problem of magnetic nanoparticles delivery, uniform distribution and retention in the tumor is suggested to be solved by using a bi-functional polymer magnetic composite, combining the embolization ability and high heating efficiency in AC magnetic fields. To this end, maghemite nanoparticles based silicone composite was developed. The initial components of the composite are selected so that the material stays liquid during 20 minutes, providing the opportunity for transcatheter transportation and filling of the tumor vascular system. After the induction period the viscosity increases rapidly and soft embolus is formed causing the occlusion of the tumour's blood vessels. The radiopaque property of composite required for the monitoring of its deposition is achieved by the addition of potassium

iodide. Magnetic nanoparticles uniformly distributed in the composite provide its rapid heating under exposure to the AC magnetic field. The SLP value does not depend on nanoparticles concentration as solely Néel relaxation of magnetization accounts for heat losses in composite. The achieved value of specific loss power belongs to the highest possible for such type of material.

Ing. **Pavel Urbánek**, Ph.D.

Date of defence: 24. 6. 2014

Supervisor: doc. Ing. et Ing. Ivo Kuřitka, Ph.D. et Ph.D.

Electronic Properties of Thin Polymer Films: A Study of Structure between Nano- and Microscale

Abstract

The main goals of the research presented in this thesis are preparation of thin polymer films and study of their optic and optoelectronic properties considering the structural ordering depending on their thickness with fundamental impact on final applications. As reference materials were used both Sigma- and Pí-conjugated polymer material, namely polysilanes and derivative of polyphenylenvinylene - MEH-PPV. A brief theoretical background for conjugated and conductive polymers is reviewed in Chapter 1. The possibilities, how to improve their properties by preparation of composites with functionalized nanoparticles, are discussed in Section 1.2. Main techniques for thin films preparation and casting are discussed and described in Chapter 2. In Chapter 3 are mentioned and described techniques used for characterization of prepared thin films. Chapter 4 summarizes the main goals of this thesis. In Chapter 5, the method and conditions for thin films casting from neat MEH-PPV polymer, polysilanes and from composite material are described in more detail and results and experience achieved during the sample preparation are discussed. In Chapter 6, Section 6.1, a photoluminescence study of thin films from neat MEH-PPV is reported. In Section 6.2, the study of exciton diffusion length in thin MEH-PPV films is presented. Material properties are studied and interpreted from microphysical point of view, photoluminescence changes and inter- or intrachain exciton recombination or changing diffusion exciton length differing in thin and thick films are discussed. These physical properties are most important for practical use and are strongly dependent on the structural ordering in thin films, which has been shown to be tightly related to the thickness of films. In

Chapter 7, Section 7.1, a comprehensive photoluminescence study of polysilanes is introduced and the results discussed in terms of spectral changes depending on the film thickness. In Section 7.2, the UV-degradability study of polysilanes is presented. Not only the polymer deterioration but also self-recovering processes occur in polysilanes films during and after UV irradiation. This study together with earlier published results support the theory of different conformational ordering of polymer chains depending on the films thickness as in case of Pí-conjugated polymer. In Chapter 8, the work is targeted on the composite preparation from MEH-PPV and ZnO and CdS nanoparticles and evaluation of improved properties of this material used for final application, i.e. polymer OLED devices and hybrid structures for photovoltaic. Chapter 9 is framed as a summary of conclusions of this thesis. In Chapter 10, are brought several author's suggestions for future research in the field of semi- or conductive polymers, i.e. Sigma- and Pí- conjugated materials in respect to specific conditions and methods which are available in the Centre of Polymer Systems at the Tomas Bata University in Zlin.

Degree Programme: CHEMISTRY AND MATERIALS TECHNOLOGY

Degree Course: Chemistry and materials technology

Ing. **Ondřej Rudolf**, Ph.D.

Date of defence: 8. 10. 2014

Supervisor: prof. Ing. Antonín Klásek, DrSc.

Synthesis of Heterocycles based on Quinoline-2,4-diones Scaffold and the Study of Their Properties and Subsequent Transformations

Abstract

Presented dissertation thesis deals with a short literary summary about preparative methods of 4 hydroxyquinolones and quinolone-2,4-diones in the first part. The second part contains an extension of own experiments divided into several sections corresponding with the thesis assignment. Introduced results were successfully published in impact journals therefore particular articles are only briefly commented. The publications form supplement part of this thesis. Recently further publication called "Reaction of 3-hydroxyquinoline-2,4-diones with inorganic thiocyanates in the presence of ammonium or alkylammonium ions: the unexpected substituti-

on of a hydroxyl group with an amino group" was sent into an editorial office of prestigious journal. Because we do not have any positive or negative answer from this editorial office up to now, the article is not shown and discussed in detail.

Ing. **Lubomír Šánek,** Ph.D.

Date of defence: 26. 6. 2014

Supervisor: prof. Ing. Karel Kolomazník, DrSc.

Praparation of Bioproducts from Wastes of Food and Tanning Industries Focused on the Production of Ecological Fuels

Abstract

The doctoral thesis deals with the preparation of organic products from wastes generated by the food processing and tanning industries, with special focus on the preparation of ecological fuels. There is a growing tendency worldwide to use biodiesel as an alternative renewable fuel for diesel engines. For this reason, great efforts has been put into research in environmentally friendly and economically viable way of biodiesel production not only from conventional feedstock (vegetable oils), but also from alternative feedstock such as tannery waste fats. However, tannery waste fat cannot be processed directly by conventional technologies since it contains high proportion of free fatty acids and non-fat components. The key solution is the pre-treatment of the input feedstock. The innovative way is the refining melting with subsequent liquid extraction with methanol or with addition of equimolar amount of alkali. The main objectives of the work are optimization of the pre-treatment process of feedstock for biodiesel production with the subsequent optimization of the reaction mixture compositions and reaction conditions in biodiesel production from tannery waste fats. Priority attention is paid to tetramethylammonium hydroxide that is used as an alkali in esterification of free fatty acids and simultaneously as a transesterification catalyst, which makes biodiesel production from tannery waste feedstock economically interesting.

Ing. **Petra Ševčíková**, Ph.D.

Date of defence: 27. 8. 2014

Supervisor: doc. Ing. Věra Kašpárková, CSc.

A Study of the Formation and Characterization of a Cosmetic Emulsion System

Abstract

The need to stabilize active compounds has notably increased in recent years. The reason is to better protect the sensitive, reactive and short shelf-life ingredients contained in final products used in many areas of industry. The protection process is influenced by a variety of factors, such as interaction with other components and the volatility or toxicity of active ingredients. Therefore, modern technology has led to the development of a variety of delivery systems that effectively address these important issues. By definition, a delivery system is any type of vehicle that makes an active substance available to a target site and that can provide beneficial properties from the cosmetic or therapeutic points of view. The main objective of this doctoral thesis is to introduce some of the types of vehicles which may be used for transport of active substances in the cosmetics, pharmaceutical or food industries. This work is divided into two main parts. The first part is focused on a description of the various types of particulate systems serving as vehicles, such as emulsions, nanoemulsions, microemulsions and microparticles, wherein each mentioned system is discussed in a separate chapter in terms of their formation, characterization and properties. The work also contains a chapter that provides a mutual comparison as well as an overview of the main advantages and disadvantages of these systems and possibilities for their practical applications. The last chapter of the theoretical part of this thesis is devoted to the methods used for their characterization. In the second part of the thesis, results obtained during the doctoral work are reported in short summaries of four research papers that document the current status of the problem. At the end of the work, full-texts of the research papers are enclosed.

Ing. **Leona Wunderlichová**, Ph.D.

Date of defence: 2. 4. 2014

Supervisor: doc. Ing. František Buňka, Ph.D.

Development of New Molecular Biological Methods for the Detection of Putrescine Producing Bacteria

Abstract

This doctoral thesis deals with the development of new molecular biological methods for the detection of putrescine producing technologically relevant microorganisms. It deals with the possibility of detection of microbial producers of putrescine by methods of molecular biology, in particular the development of new methods of polymerase chain reaction (PCR) for the detection of these producers. Putrescine can be formed by microbial metabolism via several metabolic pathways in which a number of enzymes is included. There have been presented no method for the detection of metabolic pathways of production putrescine by amplification of the corresponding genes using PCR yet. The dissertation describes development of such a molecular biological method - i.e. method that allows the detection of key genes involved in bacterial production of putrescine. It was created a reliable PCR method for the detection and investigation of putrescine metabolism in gram-negative and gram positive-bacteria. The result is the creation of seven new sets of PCR primers which are designed to detect target genes .The result of this work is the creation of seven new sets of PCR primers which are designed to detect target genes. These primers have been successfully tested in PCR with 32 strains of gram-negative producers of putrescine. For the purpose of detection and research in putrescine metabolism in gram-positive strains were successfully tested sets of primers published in previous research. It was optimized PCR method in applying those primers. Sequence analysis as well as the HPLC results confirmed the specificity of the proposed methods and newly designed primers. New primers were also successfully tested for the use in other variations of PCR, such as multiplex PCR or PCR prior to reverse transcription.

Degree Programme: FOOD CHEMISTRY AND TECHNOLOGY

Degree Course: Food Technology (in Czech)

Ing. **Gabriela Nagyová**, Ph.D

Date of defence: 9. 10. 2014

Supervisor: doc. Ing. František Buňka, Ph.D.

Possibilities of Selected Hydrocolloids and Different Phosphates Application During Processed Cheese Spread Production

Abstract

The aim of this work was to study the effect of different concentrations of selected hydrocolloids (sodium alginate, agar, kappa-carrageenan pectins with different esterification degrees) and the effect of emulsifying salts with different chain length and combinations of ternary mixtures of phosphate emulsifying salts on the textural properties of processed cheese. The objects of this study were the changes of optical density to verify the hypothesis, according to which the textural changes of processed cheese depending on emulsifying salts used are possible to explain only with the data of casein dispergation intensity in matrix using individual emulsifying salts. The emulsifying salts for production of processed cheese model samples and model skim milk dispersions in the second part of practical work were composed of sodium salts of hydrogenphospate (P1; Na2HPO4), diphosphate (P2; Na4P2O7), triphoshpate (P3; Na5P3O10) and polyphosphates with different middle chain length ((NaPO3)n), where n indicates the middle value of phosphates amount linearly bound in molecule 5, 9, 13, 20 and 28. The ternary mixtures of emulsifying salts were formed by P1:P2:Pn and P1:P3:Pn combinations, therefore 10 combinations of ternary emulsifying salts mixtures were produced. The results indicate that with increasing hydrocolloids addition the hardness of processed cheese increased, although the trend of increase was not linear for all samples. In some cases of addition a marginal concentration was found, in which a noticeable change in hardness increase trend was observed. The hardness of processed cheese increased with increasing chain length of phosphate emulsifying salts addition. After an addition of ternary mixtures of emulsifying salts a specific ratio between hydrogenphosphate and diphosphate sodium was found - 1:1-3:4 (if the amount of polyphosphate was lower than 60%), which rapidly increased the hardness values of processed cheese. The comparison between polyphosphates with different chain length in ternary mixtures shows that the applied type of polyphosphate influenced the absolute values of hardness, especially if relative amount of polyphosphate was 20-50% and with decreasing amount of monomers linearly bound in polyphosphate increased the absolute hardness values. The intensive dispergation of casein proteins was gained if emulsifying salts with longer chain length were applied and the optical density decreased with increasing phosphate chain and amount of polyphosphate in ternary mixtures applied in skim milk dispersions. Because a specific ratio between hydrogenphosphate and diphosphate sodium which intensively decreased the optical density values like in processed cheese was not found, it can be stated, that casein dispergation processes after emulsifying salts addition are not the only factors, which influence textural properties of processed cheese.

Degree Programme: PROCESS ENGINEERING

Degree Course: Tools and Processes

Ing. **Kamil Kyas**, Ph.D

Date of defence: 26. 3. 2014

Supervisor: Ing. Michal Staněk, Ph.D.

The Influence of Runner's Geometry on Rubber Compound Properties

Abstract

This thesis deals with the influence of the length and shape of runners on the final properties of the injected material especially the hardness and tensile strength using different mould wall temperatures and different flow rates. At first flow analysis was made for rheological constants such as the non-Newtonian behaviour and relaxation time by using the finite element method. With the help of obtained results, an injection mould with different chosen sizes of runners, used for the injection moulding machine of the rubber compound, REP V27 Y125 was devised, designed and manufactured. The flow analysis' results show how the optimum of vulcanization is changed to any trajectory during using different amounts of rheological parameters. It was observed that with the increasing amount of these parameters temperature inside of runner rise by dissipation and the cure time is shortened for these trajectories. Other results of the analysis were supported by practical research and showed that by changing of the width, length and shape of the runners, it is possible to arrange the final properties of the product and with using the right combination it is possible to save time and energy during production of the rubber product. At first cube shaped thick walled products with an edge size of 30 mm were tested where results were evaluated by an IRHD test. Results show that runner which produce a higher flow resistance can receives earlier optimum of vulcanization than a simple straight channel. These results were supported more by the injection molding process of thin walled products which were shaped according to a tensile strain test and Crascent test. It was confirmed as the same proportion as in testing of thick walled product.

Ing. **Martin Řezníček**, Ph.D.

Date of defence: 10. 9. 2014

Supervisor: doc. Dr. Ing. Vladimír Pata

Construction of Measuring Equipment and Methods of Evaluation Creep Tests

Abstract

This dissertation is focused on the study of creep behavior of radiation- modified polymer materials and on impact on its properties. Custom test equipment for measuring creep at room and elevated temperatures that allow for easy transport to the test environment (laboratory) are designed and implemented in this paper. Both these devices are designed for small and large test samples with automatic data recording. Load of the samples is implemented by placing a lever below the test specimen and using weight. Implementation of this concept maintains the conditions of repeatability and reproducibility of measurement and contributes to a more complex arrangement of functional components. Evaluation is carried out by statistical-mathematical methods while taking into account the number of measurements and by using the measured results for further processing. The data are evaluated with focus on the evaluation of the data in intervals. Evaluation of their variances is performed using the non-parametric and parametric hypotheses and theories and applications in order to compare the influence of radiation dose on the creep properties of the tested materials. The results showed the influence of radiation dose of crosslinking on the creep characteristics and the advantages of the statistical evaluation of the data interval methods.

1.2 Faculty of Management and Economics

Degree Programme: ECONOMICS AND MANAGEMENT

Degree Course: Management and Economics

Mgr. **Václav Bezděk**, Ph.D.

Date of defence: 29. 4. 2014

Supervisor: prof. Ing. Zdeněk Molnár, CSc.

Possibilities and Limits of Fuzzy Logic to Solve Problems of Economics and Management

Abstract

The expansion of fuzzy logic concerned literature is characterized as explosive. Yet, there is not any coherent research dealing with using of fuzzy logic in solving economical and management problems to date. This analysis is the aim of the dissertation work - we analyze recent use of fuzzy logic in Czech business companies. The paper describes main terms and principles of fuzzy logic, brand new or already published and verified specific alternatives of application, and concluded research which is mapping the using of fuzzy logic in Czech business companies and difficulties of its expansion among them. It is necessary for a business company which endeavours to remain in the market to stabilize its position, to have straight strategic plan for its future existence and to maintain a competitive advantage. This advantage could be the innovative and favourable solving of some problems which the company is dealing with. The research we realized shows that fuzzy logic is more advantageous than so far used methods in solving many problems, and that the application of fuzzy logic would be acceptable for Czech business companies. Thus, this paper can play the role of introducing of fuzzy logic for everybody, who wants to solve their problems in another and advantageous way.

Ing. **Lenka Harantová**, Ph.D.

Date of defence: 25. 4. 2015

Supervisor: doc. Ing. Vratislav Kozák, Ph.D.

The Effectiveness of Selected Topics of Social Advertising Focused on University Students under 26 Years

Abstract

Dissertation is dealing with the issue of social advertising in the Czech Republic. Specifically, it is focused on perception of social advertising by the target group of university students under 26 years with topics such as: smoking, alcohol, sexually transmitted diseases and road safety. The main goal is to deepen the knowledge about social advertising in comparison with commercial advertising and also to recommend possible improvements to it's effectiveness focused on university students under 26 years.Theoretical solutions are based on basic concepts, their developmental changes and logical choice of topics in view of its recipients, sponsors and problems with measuring their effectiveness.For research we used questionnaires, interviews with practitioners and also with academicians and doctors. As well focus group provided valuable

information. Also the focus group consisted of university students under 26 years. This dissertation has brought new theoretical knowledge about social advertising in connection with commercial advertising and its social connotations variant. If we apply the theory into practice, we can achieve increased efficiency of social advertising by using impressive appeals and combination of all factors, which can minimize the harmful consequences of failures of individuals or social groups. This dissertation can contribute to improving the quality of population life.

Ing. **Ondřej Chwaszcz**, Ph.D.

Date of defence: 17. 12. 2014

Supervisor: doc. Ing. Jitka Kloudová, Ph.D.

Creative Economy and its Contribution to the Economic Development of a Country

Abstract

The significant progress in the field of technology and knowledge have raised an efficiency of basic production factors and thus contributed to an economic growth. In last few years, a new factor known as creativity have increasingly started appearing in the field of economic growth. The contribution of this factor is specific because as an only factor it enables an economic growth ceteris paribus. The thesis defines gradually the paradigm of creative economy. It defines the theoretical concept that takes creativity as an inseparable part of the economic development. Subsequently, it focuses on its main goal, which is to create a methodology for measuring of creative potential of countries, and individual regions. To achieve this, an analytical tool has been created. This tool enables to chart the creative potential of a particular region parts. So called "New Creative Index" is based on the presented theoretical framework and it innovates some of the previous models. After of charting of creative potential, another tool was made. This tool enables the analysis of concentration of creative industries and their impacts on the economic development of regions. As a result, it proves the significant contribution of creativity for the economic development of a region. The structure of the thesis is based on the author's publication activity. The scientific papers were adjusted in order them to form a coherent study. Because of this, the thesis includes many analytical outputs and therefore, it also charts the contribution of creativity for the regional development in a larger scale. At the beginning of the

analytical part, the thesis presents the structure of its own analytical tool. In the next part, it focuses on the relation between the creative potential and macroeconomic indicators. The result presented in the thesis confirms the basic hypotheses that assumed a significant importance of interactions between creativity and economic development.

Ing. **Martina Kopečková**, Ph.D.

Date of defence: 17. 12. 2014

Supervisor: doc. Ing. Vratislav Kozák, Ph.D.

The Use of Product Placement as an Expanding Marketing Tool in the Czech Republic

Abstract

The aim of the dissertation thesis was to identify clearly the characteristics of the product placement application as a marketing tool in the Czech audiovisual media. The work is specialized in the product placement use in Czech films, series and television programmes. On the basis of the research the suggestions of the methods of product placement application in Czech organizations were established. While creating an audiovisual work the specific rules affecting the product placement efficiency have to be respected. These rules were followed by the definition concerning the price and product placement efficiency evaluation. The essential part of the suggestions was the identification of the involved groups influence on the product placement. The thesis focused on the definition of the key factors influencing the product placement efficiency. The key factors were divided into three categories including the product placement application methods, the emotional influence and the marketing indicators. Among the aforementioned categories the emotional influence such as a viewer's attitude to an actor, the attitude to a film character, the attitude to an audiovisual work and the emotions of the moments as well as ethical influence seemed to be currently the most important category. The suggestions regarding the product placement application methods are also discussed in the thesis. The characterisation of product placement influence on the companies' competitiveness was treated in the final section of the thesis.

Mgr. **Eva Kotová**, Ph.D.

Date of defence: 17. 12. 2014

Supervisor: doc. Ing. Vratislav Kozák, Ph.D.

The Methodology of Effective Event Marketing

Abstract

The dissertation thesis solves the issue about effective event marketing both in terms of successful event realization, and in terms of fulfillment of the goals of the company. The aim of this dissertation was based on research, analysis, literature search of monographic and seriál literature and practical experience in event marketing to design the methodology of effective event marketing. Dissertation thesis is divided into five chapters. The first chapter contains a literature search of monographic and seriál literature related to event marketing. It turned out that although the event marketing plays an important role in the communication of companies, the very concept of effectiveness in the context of event marketing meets with significant shortcomings. The literature that would be given to the effectiveness of event marketing has not been published yet.The second chapter is devoted to objectives of dissertation, research questions and defined hypotheses. The third chapter discusses the method sutilized in the dissertation. The fourth chapter contains the main results of the work; it includes the results of the primary marketing research and proposed methodology of effective event marketing. The fifth chapter clarifies the theoretical and practical benefits of the work. The thesis includes three cases tudies that were developed by the author on the basis of the three events realization, with the aim to test the proposed procedure when the implementation of effective event marketing.

Ing. **Zdeněk Novák**, Ph.D.

Date of defence: 27. 2. 2014

Supervisor: doc. Ing. David Tuček, Ph.D.

Energy Processes Management and Performance Measurement in Production Companies using Key Performance Indicators according to Sampled Methods from Performance Measurement System

Abstract

Thesis of dissertation contains author's proposal of procedure of dissertation's target fulfilment. Target of the dissertation is creation the guides and principles of the energy process management and performance evaluation in the production plants. The main target of dissertation is evaluate the actual situation of the energy processes management and its performance evaluation with a view to efficient management of the energetic and process optimalization. The output of dissertation will be the methodological procedure proposal of the energy management and energy processes performance evaluation based on Key Performance Indicators in methods sampled from Performance Measurement system. The KPI´s structure should be generally used by the industrial plants in their energy processes. Next the complex basic performance evaluation indicators proposal in processes which proceed in energy departments will be created. In prologue author explains reasons of choosing given theme. Next chapter presents current state solved problematic followed with the third chapter defining objectives and dissertation's hypothesis. In the following chapters defines theoretical frame, introduces methodology, and presents experimental part, results and contributions.

Ing. **Milan Přibyl**, Ph.D.

Date of defence: 27. 2. 2014

Supervisor: doc. Ing. Zdeněk Dytrt, CSc.

Ethics and its Role in Customer Relationship Management

Abstract

The Doctoral thesis is focused on the issue of the principles of business ethics and responsible management in the context of building customer relationships. The aim of the thesis is to identify the key principles of ethics fundamentally affecting building and developing customer relationships. The work is based on the assumption that a long-term customer relationships based on mutual trust is a prerequisite for increased performance and long-term prosperity of the company. The research part of the work will focus on medium and large companies operating in information and communication technologies. The main benefit of the work will be proposal of methods, tools and recommendations, enforcing ethics in management companies. The Doctoral thesis is divided into several parts. The first part of the thesis is devoted to the current state of solved problems, presents different approaches to our and foreign authors on the content of concepts in business ethics and responsible management, discusses the evolution of

business ethics and responsible management plans over the timeliness of solved problems and the reasons for the application of ethics in business. Furthermore, this section concerns building long-term relationship with the customer, ethics and its role in building customer relationship and the role of ethics in building customer relationships in the field of ICT. The end of the first part of the thesis are describes the methods, tools and principles of ethical management and defined theoretical basis of the dissertation. In the second part of the thesis defines the objectives of the dissertation and established the basic hypotheses. The third part describes the basic methods of scientific research, that was used in the research and verification of hypotheses. The fourth section shows the main results of the thesis, verifies hypotheses and suggests methodological recommendations to support enforcing ethics in management. The final part summarizes the benefits of thesis for the development of scientific knowledge and businesspractice.

Ing. **Jana Roubalíková**, Ph.D.

Date of defence: 29. 4. 2014

Supervisor: doc. Ing. Jitka Kloudová, Ph.D.

Value Orientation and Use of Appeals in Printed Advertisement in the Czech Republic

Abstract

The dissertation thesis deals with the value orientation of the Czech Republic consumers and is focused on the marketing branch, dealing specifically with printed advertisements. In adverts, not only the printed one but generally, the properly adjusted values are one the basic elements of the advertisement's success. The thesis uses observations defined by S. Schwartz, R. W. Pollay, G. Hofstede and others. It is also drawn from personal survey aiming at definition of different value orientations of the Czech consumers. The main task of the thesis is to provide comparison of relations between value orientation of the Czech consumers and reality depicted in printed advertisements. The thesis also tries to find out which appeals, informational content, strategy, form of the message and its execution occurs in printed adverts in the Czech Rep. Another task of the dissertation is to make a suggestion the most appropriate appeals in the printed advertisement for consumers of the Czech Republic.

Ing. **Libor Sarga,** Ph.D.

Date of defence: 29. 4. 2014

Supervisor: doc. Mgr. Roman Jašek, Ph.D.

Organizational Security Processes and Crisis Management in the Knowledge Society

Abstract

Information and Communication Technology (ICT) forms infrastructure basis of most modern organizations in all economic sectors and has become more popular with individuals via new products and its ubiquitousness. Companies use ICT to fulfill both operational objectives and strategic goals, outlined in their fundamental documents. Nowadays, whole industries including algorithmic and high-frequency trading, online retailing, energy industry, military, and health care all assume uninterrupted ICT functionality and continuous availability. The repeated financial, material, and human losses that have occurred recently demonstrate this status should not be taken for granted. It is the author's belief and the focus of this dissertation that the primary cause for these losses is people, and their actions. Hence, each employee should strive to minimize threat exposure. The doctoral thesis deals with corporate- and user-centric ICT security. Based on evaluation of secondary sources, assumptions for the research part will be formulated by first assessing the current state. The research output will then help formulate recommendations to promote increased security of ICT and users coming into contact with sensitive electronic assets whom the attackers consider a valuable source of information. The ICT security governance model in chapter nine articulates recommendations for major aspects of organizational policies such as BYOD management, employee training, infrastructure hardening, and password management which are discussed and best practices devised. The result of implementing the model should be an organization capable to face existing and novel threats, and educated, security-conscious employees.

Ing. **Radomír Šerek**, Ph.D.

Date of defence: 25. 4. 2014

Supervisor: doc. Ing. Zdeněk Dytrt, CSc.

Ethical Service Management

Abstract

Dissertation work is focused on service and customer relationship management with regard to ethical aspects. On the basis of literature retrieval the ethical approaches seems to be a positive contribution to management of services and management as general. In practical part is analyzed a current state of ethics and what prevents to its higher application in business practice. If a company makes an effort to reach a success then it should not act as an isolated organization but should respect specific inner and outer conditions and fulfill certain further prerequisites (as for instance pyramid of success in services). For conformation and satisfaction of customer expectations are important the terms as value and quality of service and how these are influenced. Quality of service should be a target also for service providers because there are stipulations about relation between quality of service and profit. This so called chain between quality of service and profit was followed by the author of dissertation work with his own exploration focused on analysis of relations between satisfied employee, satisfied customer and business success of service organization. Presented results confirm direct correlation between customer satisfaction and business success. Concerning the relation between employee satisfaction and customer satisfaction the author did not find significant correlation. Author's practical experiences speak rather about importance and quality of processes in companies providing services. Therefore he comes with a methodology for evaluation of service processes which aim is to reach so called service excellence. Dissertation work fundamental findings are summarized into a graphical model of services management which could be another assistant for practical management of services.

Ing. **Veronika Šišková**, Ph.D.

Date of defence: 17. 9. 2014

Supervisor: doc. Ing. Michal Šimon, Ph.D.

The Work Environment Design and its Effect on Worker Efficiency

Abstract

The dissertation solves the relationship between physical factors in the workplace and assesses their impact on employee performance. The main goal is to find suitable criteria of physical factors for evaluating the workplace and develop a model for calculating the performance of the worker. The resulting model will incorporate ergonomic statutory requirements on the work-

place and financial evaluation in dependence on final performance of the worker. The first section is based on foreign and domestic literature search, features the legal requirements for physical work environment factors and their influence on employee performance. It indicates actual statistic data describing the health harm arising from improper design of the working environment. By identifying the main aim and hypotheses were chosen methods of dissertation work. From results of quantitative and qualitative research which included statistical calculations was assembled the model that is able to quantify the performance of the worker. The final part is devoted to the benefits of dissertation for science, practice, and possibilities the model extending.

Ing. **Jana Štefánková**, Ph.D.

Date of defence: 26. 6. 2014

Supervisor: prof. Ing. Ján Porvazník, PhD.

Application of Competence Models in Terms of University Management

Abstract

The doctoral thesis by the title "Application of Competence Models in Terms of University Management" deals with the sector of education institutions and their significant impact on the development and society. It focuses particularly on the segment of quality of university institution and quality of a selected section of its human potential. The thesis is divided into five main chapters. The introduction devoted to the justification of the research subject is followed by the chapter on the current state of the subject. The following chapters define the research objectives and methods. The conclusion summarises the attained results and outlines further research procedure.

Ing. **Jiří Vaněk**, Ph.D.

Date of defence: 17. 12. 2014

Supervisor: doc. Ing. Zdeněk Dytrt, CSc.

The Corporate Social Responsibility Concept and Its Impact on the Emergence of Externalities in the Market

Abstract

This dissertation is dealing with problems of the corporate social responsibility concept and the impact of this trend on the creation of externalities in the market of the Czech Republic in connection with the use of corporate tax base reduction under the Act, the Income Tax Act 586/1992 Coll. The work is focused on the activities of companies in all three areas of corporate social responsibility (social, economic and environmental), where in some cases appears the substitution of governmental responsibility by the private sector. Some selected activities of the company are able to reduce the tax base and thus low down the tax liability, resulting in a reduction in revenue to the state budget and the allocation of financial and non-financial resources to selected groups, but meanwhile there is increase of utility of parties which goes along with the state strategy. The main goal is to deepen the knowledge about the impact of social responsibility concept on the market environment, in particular the creation of externalities and to create a model of CSR differentiation from the perspective of financing selected activities.The work I divided into several parts. The introduction explains the reason for the choice of subject and the importance of this topic. The following chapters describe current state of the topic not only in our country but also abroad, focusing on the theoretical basis, but also on the practical impact. The chapters also capture the trend, aspects of corporate social responsibility and connection with the creation of externalities in the market. Another part specifies the research objectives, bases of analytical procedures in the form of hypotheses and research questions, which were verified after survey.In other part a model was created, which refers to the impact of CSR concept on the creation of externalities in the market environment and model of differentiation of the company in terms of financing CSR activities. The benefits of work for science, practice and teaching are presented in the final chapter.

Degree Programme: ECONOMICS AND MANAGEMENT

Degree Course: Management and Economics

Ing. **Yiying Guo**, Ph.D.

Date of defence: 25. 9. 2014

Supervisor: doc. Ing. Miloslava Chovancová, CSc.

Luxury Brand Marketing: Consequence of Chinese Consumer Behavior

Abstract

China's GDP became the second highest in the world in 2012. Chinese luxury brand market is developing rapidly, which sees great potential. The main objective of doctoral thesis is to create a new model for providing guidance in marketing practices for European luxury brands enterprises which focus on Chinese market. The research does a comprehensive analysis on a series of real behavior of Chinese luxury consumers to examine their general patterns, characteristics and predict the future trends of their luxury brands purchase behavior. The main objective is supported by several subobjectives: (a) to determine the demographic characteristics of Chinese luxury consumers; (b) to determine Chinese purchase behavior characteristics on luxury products; (c) to analyze the influencing factors of Chinese luxury consumption; (d) to analyze the Chinese luxury consumer motivation. On the basis of primary and secondary market data collection, the research develops a quantitative research scale. And then the research conducts sampling and uses SPSS analysis, to achieve the empirical research results about Chinese luxury brand consumer behavior. On the basis of influencing factors analysis, the research establishes a model to test the significant difference under different demographic characteristics. The research results innovatively present community motivation in Chinese luxury consumer motivation model, which is thus extended to three levels - individual motivation, community motivation and society motivation. Scientific and marketing practical knowledges are both obtained, and it recommends the European luxury brand enterprises: (a) to focus on consumer community motivation; (b) to pay attenttion to influencing factors differences; (c) to analyze luxury brand consumer basic behavior. An application of luxury brand marketing strategy on Chinese market is developed on the enterprise of traveling and tourism agency.

Liyanarachchi Nanayakkara Abeysiri Chandana Jayawardena , BSc., MBA, Ph.D.

Date of defence: 25. 9. 2014

Supervisor: doc. Ph.Dr. Aleš Gregar, CSc.

Impact of Strategic Emotional Intelligence to Managerial Self Efficacy and Career Success

Abstract

Organisational capabilities form the core component of business architecture. Human capital defines organizational capabilities and findings suggest that human intelligence is inherently

involved in intellectual capital. The pluralistic views of intelligences contributed to the increased attention among psychologists for delimitations of human intelligence. Interests in 'emotional intelligence' (EI) research got prominence through developments in mid-1990's, which lead to the identification of EI as a distinct form of intelligence. Among the many initiatives on EI research, only a few have represented empirically oriented scholarship. Key unresolved issues are the EI assessment techniques and cross cultural validation of EI. Study has attempted to address the above research gap providing empirical findings on the implications of EI sub constructs/domains in the world of work. Career success and occupational self-efficacy (OSE) have been employed as the real life outcomes in examining the intricacies of EI construct. The aim of this study is to examine the impact of strategic EI to career success and OSE of managers in varying sociocultural and geographic contexts using multifarious assessments. Research has ventured into this by examining 'comparable contexts' across socio-geographic contexts. The most advanced domain of EI namely strategic EI (Managing Emotions per se) has been chosen to examine the impact of EI. Study has examined the features and implications in the multifarious assessment outputs of strategic EI of managers in varying sociocultural and geographic contexts, with specific focus on the impact of strategic EI to career success. Sri Lanka and Czech Republic were selected for the study after examination of country profiles, with specific emphasis on socio-demographic indices. Study was focused on the impact of strategic EI on the careers of 186 banking & finance industry professionals in these two countries. Descriptive and inferential analyses have been conducted with multiple comparisons involving a multitude of factors using multifarious EI assessments. Study findings have contributed to new scientific knowledge to the existing theory and practice. Study has drawn special attention to the cross cultural validation of the impact of strategic EI to OSE and career success in varying socio-demographic contexts. It provides guidelines to carry out in-depth analyses of EI research. Study also provides guidelines for scholars and practitioners of the impact of strategic EI in above contexts.

Degree Programme: ECONOMIC POLICY AND ADMINISTRATION

Degree Course: Finance

Ing. **Eva Kramná**, Ph.D.

Date of defence: 17. 12. 2014

Supervisor: prof. Dr. Ing. Dana Dluhošová

Business Valuation using Real Options Approach

Abstract

The Doctoral Thesis deals with the real options in relation to business Valuation. The main aim of the Doctoral Thesis is to analyze and verify the aplication of real option methodology for determining the value of company and determine the assumptions and limitations in practice. The assumption for achieving this goal is critical literature review of available sources, analysis and valorize possibilities of integrating flexibility into the value of the business and the problems associated with the determination of the input parameters of the real option model. Real options methodology will be verified to concrete companies. On the basis of gained knowledge, assumptions and limitations will be established for its application in practice.

Ing. **Šárka Papadaki / Fialová**, Ph.D.

Date of defence: 16. 4. 2014

Supervisor: doc. Ing. Boris Popesko, Ph.D.

Cost Management in Health Organizations

Abstract

The doctoral thesis on a topic "Cost management in health organizations" deals with the allocation of costs in hospitals in the Czech Republic. The first part of this work addresses the current situation in the area of cost management. Among others, the emphasis is put on the specifics given by the health sector. Furthermore, there are goals defined, hypotheses are set and the methodology for the thesis processing is described in this work. The main part of the thesis is dedicated to the results of the research in the area of the cost management in hospitals in the Czech Republic. Further, a methodology for introduction of a modern calculation method (i.e.

method Activity Based Costing - ABC) into a selected hospital is described. In conclusion, the strengths and weaknesses of applying this method in conditions of hospital facilities are evaluated.

Ing. **Jana Vychytilová**, Ph.D.

Date of defence: 18. 12. 2014

Supervisor: doc. Ing. Miloš Kráľ, CSc.

Algorithm for Evaluating Correlations between Market Indices and its Usage for Quantifying the Linkages between Traditional Asset Markets

Abstract

The main goal of this doctoral thesis is to design an algorithm for evaluating correlations between market indices and to quantify the linkages among traditional asset market categories-stock, bond, currency and commodity markets by following the steps of the algorithm. HKTI algorithm based on testing statistical hypotheses about normality and independence is used to detect the presence or absence of links between global traditional asset market benchmarks Standard & Poor's stock index, the 30-Year US Treasury Bond Price Index, Dollar Index and the Thomson Reuters / Jefferies CRB index. The research is conducted in a pre-defined period from 3.1.2000 to 1.8.2014 on the basis of monthly closing prices converted to the monthly relative returns by horizontal analysis. Through the global macro-analysis the interval of basic macroeconomic conditions of this research is determined allowing the future comparison. The empirical results of this thesis provide new insights, inter alia, useful in the areas of global tactical asset allocation, evaluation of business cycles and trend analysis. New pictogram of traditional and inter market analyses interconnection FATAPAIACorrA is designed. This thesis combines knowledge in the field of international finance, statistics, macroeconomics and econometrics and provides new insights in this matter.

1.3 Faculty of Applied Informatics

Degree Programme: ENGINEERING INFORMATICS

Degree Course: Automatic Control and Informatics

Ing. **Jiří Marholt**, PhD.

Date of defence: 10. 9. 2014

Supervisor: doc. Ing. František Gazdoš, Ph.D.

Unstable Systems: Robust Control with Saturated Control Input

Abstract

This paper deals with the methodology of controller design for unstable systems. Polynomial approach is used for the synthesis of controller considering robust control and control input limitation. Firstly the survey of unstable systems is illustrated and after that the methods of controller design for unstable systems are demonstrated. Derivation of individual control configurations 1DOF 2DOF and TFC using the polynomial approach resulting the pole-placement problem follows. Proposed control is improved with the help of robust control techniques with the consideration of control input limitation. Control input response of proposed control fulfils the requirement that itis located in the specified interval of upper and lower limitations. This task is addressed numerically by means of standard MATLAB functions for nonlinear optimization with the aid to fulfil control input limitation and robustness of the resultant loop. Controller for a specified type of unstable systems can be easily proposed by means of the created programme environment. The proposed methodology is demonstrated on selected types of unstable transfer function and also on the real model of magnetic levitation for one and more optimized parameters.

2 DEFENDED HABILITATION THESES

In 2014, 4 habilitation theses were defended: 3 at the Faculty of Technology and 1 at the Faculty of Management and Economics.

2.1 Faculty of Technology

Course: Technology of Macromolecular Compounds

doc. **Petr Filip**, CSc.

Appointed with effect from: 1st June 2014

Analysis of Flow Behaviour of Non-Newtonian Fluids

Abstract

Description of flow behavior of non-Newtonian fluids participates in modeling practically all polymer processes. The aim of the presented habilitation thesis is to present the results in the following three topics: back extrusion technique; modelling of non-monotonous behaviour of shear viscosity; flow in concentric annuli.

Back extrusion technique enables to evaluate the adjustable parmeters in basic viscoplastic models with inaccuracy that is fully negligible in practice. This relatively simple and money saving approach thus eliminates usage of sophisticated but very expensive rotational rheometers.

In contrast to a description of monotonous course of shear viscosity in dependence on shear rate (stress) for which there exist a series of applicable empirical (phenomenological) models, the models respecting non-monotonous behaviour are practically missing. The aim is to present the models describing such non-monotonous behaviour.

A relation volumetric flow rate vs. Pressure gradient represents one of the principal relations characterizing polymer processes. There is presented an explicit algebraic relation for power law fluids in concentric annuli depending only on the entry (geometrical, kinematical and rheological) parameters.

doc. Ing. **Martina Hřibová**, Ph.D.

Appointed with effect from: 1st November 2014

Crystallization of Chosen Polymers – Structural and Morphological Studies

Abstract

The presented work comprises the research results of the crystallization, structure and morphology of some commercially important linear polymers as well as some theoretically interesting, newly prepared liquid crystal polymers. The effect of the polymerization conditions and of further modifications on the resulting polymer structure and properties were described.

doc. Ing. **Tomáš Sedláček**, Ph.D.

Appointed with effect from: 1st June 2014

The Role of Pressure in the Flow Behaviour of Polymeric Systems: Application and Implementation

Abstract

The presented habilitation thesis provides a comprehensive review of the field of characterization of pressure-affected flow propertis of polymeric materials, as an appropriate tool for the optimization of their manufacturing processes. Within this framework, individual accessible methods enabling the description of pressure influence on polymer melt flow behaviour are presented; values of the pressure sensitivity coefficients of a number of unfilled and filled polymeric systems determined by employing a high-pressure capillary rheometer are tabulated; moreover, the omission and incorporation of viscosity pressure dependencies are illustrated through an injection moulding process simulation; finally, together with a demonstration of the possibility of the modification of the viscosity and free-volume behaviour relations for polymer mets under various conditions of temperature and pressure, the feasibility of pressure dependencies of viscosity prediction based on a knowledge of PVT diagrams and temperature-affected flow behaviour are introduced.

2.2 Faculty of Management and Economics

Course: Enterprise Management and Economics

doc. Ing. **Adriana Knápková**, Ph.D.

Appointed with effect from: 1st April 2014

Use of Selected Concepts for Performance Measurement and Management of Enterprises in the Czech Republic and their Impact on Financial Performance of Companies

Abstract

The aim of the habilitation thesis was to evaluate the effect of the use of selected performance concepts (BSC, EVA, ABC, CRM) on achieving higher financial performance of companies and to identify synergetic effects of these concepts to improve performance measurement and management of companies.

The current state of knowledge on the issue was documented by citation analysis conducted using the Web of Science database. It was followed by a critical literature review carried out on the issue of performance measurement and management of companies, the genesis of the tools used for performance measurement and management of enterprises, the impacts of using these tools on financial performance, and synergetic effects arising from a joint implementation of the selected performance concepts.

An extensive questionnaire survey (a total of 350 enterprises in the Czech Republic) revealed that the BSC was used by 13% of enterprises, EVA by 18%, ABC by 19% and finally CRM by 26% of enterprises, which is less in comparison with similar studies conducted in developed countries. A company's size affects the use of BSC and EVA, which was confirmed by chi-square. The use of the chi-square did not confirm the impact of company specialization and "company age" on the use of individual performance concepts. It was also tested whether the use of performance concepts in corporate practice improved the financial performance of companies. Due to the requirements on accounting data to calculate financial performance indicators a modified sample was used (a total of 167 companies). As financial performance indicators were selected ROE and ROA. The testing was carried out using Wilcoxon test. Although enterprises using the selected performance concepts were mostly reaching higher mean profitability, the differences in the achieved performance could not be with regard to the results con-

sidered significant. Using the Wilcoxon test, it was found that neither the level of satisfaction of managers with the use of the selected performance concepts had any effect on the financial performance. Only in case of the concept of CRM, the Wilcoxon test carried out in 2010 demonstrated that enterprises led by managers who were satisfied with the use of the concept of CRM achieved higher financial performance.

The benefits of the habilitation thesis also consisted in conducting the analysis and subsequent synthesis of synergetic effects that are provided by the joint implementation of the selected performance concepts. Further to the identified synergetic effects of jointly implemented performance concepts, a proposal of an integrated model for measuring and managing performance of companies (BSC + EVA + ABC + CRM) was introduced. The "spirit" was given to the model by integrating business and life philosophy of T. Bata and it was recommended to all entrepreneurs to implement its selected elements in their own business models. In conclusion, there were specified constraints of this work as well as suggested possibilities for further research in this area.

3 QUALIFYING LECTURES FOR PROFESSORSHIP

3.1 Faculty of Technology

Course: Technology of Macromolecular Compounds

prof. Ing. **Mohamed Bakar,** Ph.D.

Qualifying Lecture for Professorship in front of the Scientific Board of TBU in Zlín: 7th January 2014
Appointed with effect from: 18th December 2014

Modification of Epoxy Resin using a Combination of Two Modifiers : Hybrid Epoxy Nanocomposites

Abstract

This lecture presents a critical review on epoxy resins modified with nanoclay particles and other selected modifiers. The different methods used in the preparation of epoxy nanocomposites and the underlying toughening mechanisms are briefly described. The hybrid epoxy nanocomposites discussed include composites based on thermoplastics, rubbers particles and liquid modifiers and conventional polyaddition polyurethanes (PUR). Finally, isocyanate free polyurethanes are presented as potential non-toxic modifier for epoxy nanocomposites. Besides the environmentally beneficial characteristics, these latter modifier have provided improvements in mechanical properties when compared with conventional PUR.

4 IMPORTANT SCIENTIFIC AND SPECIALIZED ASSIGNMENTS

4.1 Projectst financed by the Czech Science Foundation (GACR)

In 2014, 10 projects financed by the Czech Science Foundation were implemented at the TBU in Zlín. Total eligible costs amounted CZK 6,995 thousand for TBU in Zlín in 2014.

4.1.1 Faculty of Technology

GAP108/10/1325 Applied rheology for advanced polymer processing
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Martin Zatloukal, Ph.D.
Implementation period: 2010 - 2014

Total project cost (CZK thous.):	2 959
Total project cost – TBU (CZK thous.):	2 959
Project cost of TBU in 2014 (CZK thous.):	599

GAP503/11/1417 Biogenic amines production in selected lactic acid bacteria strains
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. RNDr. Vlastimil Kubáň, DrSc.
Implementation period: 2011 – 2014

Total project cost (CZK thous.):	9 345
Total project cost – TBU (CZK thous.):	6 405
Project cost of TBU in 2014 (CZK thous.):	1 217

GA13-08944S Interactions of Conducting Polymers with Cells
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Petr Humpolíček, Ph.D. (implemented within CPS and FT)
Project co-investigator: Institute of Macromolecular Chemistry of Academy of Sciences of the Czech Republic
Implementation period: 2013 - 2015

Total project cost (CZK thous.):	11 860
Total project cost – TBU (CZK thous.):	6 829
Project cost of TBU in 2014 (CZK thous.):	2 297

4.1.2 Faculty of Management and Economics

GAP407/12/0821 Creating a Czech Instrument for Measuring Academic Tacit Knowledge
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Jana Matošková, Ph.D.
Implementation period: 2012 - 2014

Total project cost (CZK thous.):	2 874
Total project cost – TBU (CZK thous.):	2 874
Project cost of TBU in 2014 (CZK thous.):	1 026

GP14-18597P Creating Strategic Performance Model Framework Based on Utilization of Synergy Effects of Selected Management Systems
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Michaela Blahová, Ph.D.
Implementation period: 2014 - 2016
Total project cost (CZK thous.): 623
Total project cost – TBU (CZK thous.): 623
Project cost of TBU in 2014 (CZK thous.): 202

GP14-21654P Variability of Cost Groups and its Projection in the Costing System in Manufacturing Enterprises
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Petr Novák, Ph.D.
Implementation period: 2014 – 2016
Total project cost (CZK thous.): 707
Total project cost – TBU (CZK thous.): 707
Project cost of TBU in 2014 (CZK thous.): 244

4.1.3 Faculty of Humanities

GA13-04121S Understanding the Mechanism of Self-Regulation in Children and Minors in Institutional Care
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Mgr. Soňa Vávrová, Ph.D.
Implementation period: 2013 - 2015
Total project cost (CZK thous.): 2 323
Total project cost – TBU (CZK thous.): 2 323
Project cost of TBU in 2014 (CZK thous.): 754

GPP407/12/P196 Development Determinants of Multicultural Competence in Students of Helping Professions
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Mgr. Jakub Hladík, Ph.D.
Implementation period: 2012 – 2014
Total project cost (CZK thous.): 388
Total project cost – TBU (CZK thous.): 388
Project cost of TBU in 2014 (CZK thous.): 126

4.1.4 University Institute

GP14-32114P The modification of magnetic filler and the study of its use in magnetorheological systems
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Michal Sedlačík, Ph.D.
Implementation period: 2014 - 2016
Total project cost (CZK thous.): 1 532
Total project cost – TBU (CZK thous.): 1 532
Project cost of TBU in 2014 (CZK thous.): 530

GA13-08944S Interactions of Conducting Polymers with Cells
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Petr Humpolíček, Ph.D. (implemented within CPS and FT)
Project co-investigator: Institute of Macromolecular Chemistry of Academy of Sciences of the Czech Republic
Implementation period: 2013 - 2015

Total project cost (CZK thous.):	11 860
Total project cost – TBU (CZK thous.):	6 829
Project cost of TBU in 2014 (CZK thous.):	2 297

Projects where TBU acts as a co-investigator

GAP105/11/2342 Usage of electrorheological measurements in predictability of the process of electrospinning
Principal investigator: Institute of Hydrodynamics of Academy of Sciences of the Czech Republic
Project investigator on behalf of TBU: doc. Ing. Vladimír Pavlínek, Dr.
Implementation period: 2011 - 2014

Total project cost (CZK thous.):	4 191
Total project cost – TBU (CZK thous.):	1 773
Project cost of TBU in 2014 (CZK thous.):	0

4.2 Projects financed by the Ministry of Industry and Trade of the Czech Republic

In 2014, 2 projects financed by the Ministry of Industry and Trade of the Czech Republic were implemented at the TBU in Zlín. Total eligible costs amounted CZK 1,240 thousand for TBU in Zlín in 2014.

4.2.1 Faculty of Technology

Projects where TBU acts as a co-investigator

FR-TI4/623 *Nanostructured packeging materials of exceptional properties and easier recycling
Principal investigator: SYNPO, akciová společnost
Project investigator on behalf of TBU: Ing. Dagmar Měřínská, Ph.D.
Implementation period: 2012 – 2015

Total project cost (CZK thous.):	20 692
Total project cost – TBU (CZK thous.):	2 070
Project cost of TBU in 2014 (CZK thous.):	600

4.2.2 University Institute

Projects where TBU acts as a co-investigator

FR-TI3/424 *Electroluminescent Films for Emergency Interior Lightning
Principal investigator: NWT a. s.
Project investigator on behalf of TBU: doc. Ing. et Ing. Ivo Kuřitka, Ph.D. et Ph.D.
Implementation period: 2011 - 2014

Total project cost (CZK thous.):	23 703
Total project cost – TBU (CZK thous.):	7 558
Project cost of TBU in 2014 (CZK thous.):	640

4.3 Projects financed by the Ministry of Education, Youth and Sports of the Czech Republic

In 2014, 25 projects financed by the Ministry of Education, Youth and Sports of the Czech Republic were implemented at the TBU in Zlín. Total eligible costs amounted CZK 105,547 thousand for TBU in Zlín in 2014.

4.3.1 Faculty of Technology

CZ.1.07/2.2.00/28.0132 Increasing exclusiveness of tuition of technologies of fats, cosmetics and detergents
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Rahula Janiš, CSc.
Implementation period: 2012 - 2015

Total project cost (CZK thous.):	20 071
Total project cost – TBU (CZK thous.):	20 071
Project cost of TBU in 2014 (CZK thous.):	3 268

Projects where TBU acts as a co-investigator

CZ.1.07/2.3.00/35.0013 Partnership to support R&D popularization and further education in further popularization of technology transfer in the field of agriculture, food industry and bioenergy Principal investigator: Agritec Plant Research s. r. o.
Project investigator on behalf of TBU: doc. Ing. Pavel Valášek, CSc.
Implementation period: 2012 – 2014

Total project cost (CZK thous.):	23 454
Total project cost – TBU (CZK thous.):	1 444
Project cost of TBU in 2014 (CZK thous.):	306

CZ.1.07/2.4.00/17.0128 Coordination of the academic sphere and linking scientific findings to practice Principal investigator: University of South Bohemia is a public university located in České Budějovice
Project investigator on behalf of TBU: doc. Ing. Jan Hrabě, Ph.D.
Implementation period: 2011 – 2014

Total project cost (CZK thous.): 10 255
Total project cost – TBU (CZK thous.): 3 536
Project cost of TBU in 2014 (CZK thous.): 73

CZ.1.07/2.4.00/31.0026 Support of transfer of innovations in agriculture, food industry and bioenergy into practice
Principal investigator: Zemědělský výzkum, spol. s r. o.
Project investigator on behalf of TBU: doc. Ing. Miroslav Fišera, CSc.
Implementation period: 2012 - 2014
Total project cost (CZK thous.): 29 432
Total project cost – TBU (CZK thous.): 2 537
Project cost of TBU in 2014 (CZK thous.): 218

4.3.2 Faculty of Management and Economics

CZ.1.07/2.3.00/20.0147 Development of Manpower in the Research Field of Performance Measurement and Operation, Companies, Clusters and Regions
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Dr. Ing. Drahomíra Pavelková
Implementation period: 2012 - 2015
Total project cost (CZK thous.): 24 047
Total project cost – TBU (CZK thous.): 24 047
Project cost of TBU in 2014 (CZK thous.): 3 925

CZ.1.07/2.4.00/31.0024 Partnership for competitiveness
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Mgr. Petr Dostál
Implementation period: 2012 - 2014
Total project cost (CZK thous.): 20 108
Total project cost – TBU (CZK thous.): 20 108
Project cost of TBU in 2014 (CZK thous.): 6 535

CZ.1.07/2.4.00/31.0096 Building partnerships and strengthening cooperation in the field of lean manufacturing and services, innovations and industrial engineering with the emphasis
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Felicita Chromjaková, Ph.D.
Implementation period: 2012 - 2014
Total project cost (CZK thous.): 36 676
Total project cost – TBU (CZK thous.): 36 676
Project cost of TBU in 2014 (CZK thous.): 10 000

4.3.3 Faculty of Applied Informatics

CZ.1.05/2.1.00/03.0089 The Centre of Security, Information and Advanced Technologies (CEBIA-Tech)
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Vašek, CSc.

Implementation period: 2011 – 2014
Total project cost (CZK thous.): 174 475
Total project cost – TBU (CZK thous.): 174 475
Project cost of TBU in 2014 (CZK thous.): 5 873

CZ.1.07/2.3.00/30.0035 Development of Human Resources in Scientific and Research Activities at Tomas Bata University in Zlin
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Vašek, CSc.
Implementation period: 2013 – 2015
Total project cost (CZK thous.): 9 949
Total project cost – TBU (CZK thous.): 9 949
Project cost of TBU in 2014 (CZK thous.): 2 821

LO1303 Promoting sustainability and development of the Centre for Security, Information and Advanced Technologies (CEBIA-Tech)
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Vašek, CSc.
Implementation period: 2014 – 2019
Total project cost (CZK thous.): 98 710
Total project cost – TBU (CZK thous.): 98 710
Project cost of TBU in 2014 (CZK thous.): 4 008

4.3.4 Faculty of Humanities

CZ.1.07/2.3.00/45.0015 Centre for the Support of Science and Engineering: Technical and Scientific Laboratory for Children and Youth in Zlín Region
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Mgr. Jan Kalenda, Ph.D.
Implementation period: 2014 – 2015
Total project cost (CZK thous.): 17 588
Total project cost – TBU (CZK thous.): 17 588
Project cost of TBU in 2014 (CZK thous.): 9 135

From Beginner to Mentor (supporting strategies of teacher education in the Zlín Region) (Educational Policy Fund)
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. PaeDr. Adriana Wiegerová, PhD.
Implementation period: 2014 – 2016
Total project cost (CZK thous.): 9 556
Total project cost – TBU (CZK thous.): 9 556
Project cost of TBU in 2014 (CZK thous.): 1 907

4.3.5 Faculty of Logistics and Crisis Management

7AMB14SK044 Effectiveness assessment of aplication of continuous ecological transport systems of raw materials in industrial enterprises
Principal investigator: TBU in Zlín

Project investigator on behalf of TBU: Ing. Jan Strohmandl
Implementation period: 2014 – 2015
Total project cost (CZK thous.): 98
Total project cost – TBU (CZK thous.): 98
Project cost of TBU in 2014 (CZK thous.): 49

CZ.1.07/2.2.00/28.0185 Innovation and Development of Education in Security with the Focus of Crisis Management
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Dušan Vičar, CSc.
Implementation period: 2012 – 2014
Total project cost (CZK thous.): 11 750
Total project cost – TBU (CZK thous.): 11 750
Project cost of TBU in 2014 (CZK thous.): 2 849

4.3.6 University Institute

CZ.1.05/2.1.00/03.0111 Centre of Polymer Systems
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Petr Sáha, CSc.
Implementation period: 2011 - 2014
Total project cost (CZK thous.): 754 043
Total project cost – TBU (CZK thous.): 754 043
Project cost of TBU in 2014 (CZK thous.): 19 136

CZ.1.07/2.3.00/20.0104 Advanced theoretical and experimental studies of polymer systems
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. et Ing. Ivo Kuřitka, Ph.D.
Implementation period: 2011 - 2014
Total project cost (CZK thous.): 35 053
Total project cost – TBU (CZK thous.): 35 053
Project cost of TBU in 2014 (CZK thous.): 2 752

7AMB13AR019 Nanostructured thin layers for detection of gases and volatile organic compounds
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Petr Sáha, CSc.
Implementation period: 2013 - 2014
Total project cost (CZK thous.): 240
Total project cost – TBU (CZK thous.): 240
Project cost of TBU in 2014 (CZK thous.): 120

7AMB14SK026 (Bio)polymers and Bio-inspired Materials for Biomedicine
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Nabanita Saha, M.Sc., Ph.D.
Implementation period: 2014 - 2015
Total project cost (CZK thous.): 100
Total project cost – TBU (CZK thous.): 100
Project cost of TBU in 2014 (CZK thous.): 50

CZ.1.05/3.1.00/10.0205 Development of the TTC at the TBU in Zlín
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Dana Kreizlová
Implementation period: 2012 - 2014
Total project cost (CZK thous.): 16 185
Total project cost – TBU (CZK thous.): 16 185
Project cost of TBU in 2014 (CZK thous.): 4 122

LE12002 The support center for international cooperation in research and development in technical fields
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2012 - 2015
Total project cost (CZK thous.): 4 000
Total project cost – TBU (CZK thous.): 4 000
Project cost of TBU in 2014 (CZK thous.): 1 000

LH14050 Synthesis of Polypeptoid Nanosheets for Biomineralization
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Nabanita Saha, M.Sc., Ph.D.
Implementation period: 2014 - 2016
Total project cost (CZK thous.): 1 348
Total project cost – TBU (CZK thous.): 1 348
Project cost of TBU in 2014 (CZK thous.): 506

LH14273 Construction and electrochemical properties of supercapacitors for high efficiency energy storage systems
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Petr Sáha, CSc.
Implementation period: 2014 - 2016
Total project cost (CZK thous.): 1 797
Total project cost – TBU (CZK thous.): 1 797
Project cost of TBU in 2014 (CZK thous.): 494

7AMB13AT024 Multifunctional biocomposites based on polylactide
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2013 – 2014
Total project cost (CZK thous.): 144
Total project cost – TBU (CZK thous.): 144
Project cost of TBU in 2014 (CZK thous.): 72

4.3.7 Rectorate

CZ.1.05/4.1.00/04.0139 The Laboratory Center of Faculty of Technology
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: RNDr. Alexander Černý
Implementation period: 2011 – 2014

Total project cost (CZK thous.): 505 618
Total project cost – TBU (CZK thous.): 505 618
Project cost of TBU in 2014 (CZK thous.): 26 331

4.3.8 TBU Library

CZ.1.05/3.2.00/12.0232 STMFull: databases for research and development
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ph.Dr. Ondřej Fabián
Implementation period: 2013 - 2014
Total project cost (CZK thous.): 55 073
Total project cost – TBU (CZK thous.): 6 145
Project cost of TBU in 2014 (CZK thous.): 67

4.4 Projects financed by the Ministry of the Interior of the Czech Republic

In 2014, 1 project financed by the Ministry of the Interior of the Czech Republic was implemented at the TBU in Zlín. Total eligible costs amounted CZK 809 thousand for TBU in Zlín in 2014.

4.4.1 Faculty of Applied Informatics

VG20112014067 The critical infrastructure component and sector resilience evaluation system
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Luděk Lukáš, CSc.
Implementation period: 2011 - 2014
Total project cost (CZK thous.): 8 557
Total project cost – TBU (CZK thous.): 8 557
Project cost of TBU in 2014 (CZK thous.): 809

4.5 Projects financed by the Ministry of Agriculture of the Czech Republic

In 2014, 2 projects financed by the Ministry of Agriculture of the Czech Republic were implemented at the TBU in Zlín. Total eligible costs amounted CZK 2,082 thousand for TBU in Zlín in 2014.

4.5.1 Faculty of Technology

Projects where TBU acts as a co-investigator

QJ1210300 Protection systems of quality and safety of dairy products by means of suitable methods applicable in practice
Principal investigator: Výzkumný ústav mlékárenský s. r.o.
Project investigator on behalf of TBU: doc. Ing. František Buňka, Ph.D.

Implementation period: 2012 - 2016
Total project cost (CZK thous.): 20 093
Total project cost – TBU (CZK thous.): 2 984
Project cost of TBU in 2014 (CZK thous.): 607

4.5.2 University Institute

QJ1310254 Research into the use of whey as dairy industry waste product, the production of antimicrobial compounds for the modification of hydrophilic polymer systems
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2013 - 2017
Total project cost (CZK thous.): 16 401
Total project cost – TBU (CZK thous.): 7 339
Project cost of TBU in 2014 (CZK thous.): 1 475

4.6 Projects financed by the Technology Agency of the Czech Republic

In 2014, 8 projects financed by the Technology Agency of the Czech Republic were implemented at the TBU in Zlín. Total eligible costs amounted CZK 13,577 thousand for TBU in Zlín in 2014.

4.6.1 Faculty of Technology

Projects where TBU acts as a co-investigator

TA02011308 Hybrid nanocomposites
Principal investigator: SYNPO, akciová společnost
Project investigator on behalf of TBU: doc. Dr. Ing. Vladimír Pavlínek (implemented within CPS and FT)
Implementation period: 2012 - 2014
Total project cost (CZK thous.): 14 847
Total project cost – TBU (CZK thous.): 1 632
Project cost of TBU in 2014 (CZK thous.): 546

TA03010724 AV and EV LED luminaire with a higher degree of protection
Principal investigator: TREVOS, a. s.
Project investigator on behalf of TBU: Ing. Štěpán Šanda, Ph.D.
Implementation period: 2013 - 2015
Total project cost (CZK thous.): 14 655
Total project cost – TBU (CZK thous.): 2 000
Project cost of TBU in 2014 (CZK thous.): 700

TA03010799 Use of nanostructures and natural extracts as functional substances in active packaging materials with barrier, antimicrobial, protective and oxygen absorbing effects
Principal investigator: INVOS, spol. s r. o.
Project investigator on behalf of TBU: Ing. Dagmar Měřínská

Implementation period: 2013 - 2015
Total project cost (CZK thous.): 6 125
Total project cost – TBU (CZK thous.): 2 180
Project cost of TBU in 2014 (CZK thous.): 720

TA04020258 Advanced technology of lithotrophic immobilization and anaerobic bioremediation for the remediation and prevention of environmental damage
Principal investigator: EPS, s. r. o.
Project investigator on behalf of TBU: doc. Mgr. Marek Koutný, Ph.D.
Implementation period: 2014 - 2017
Total project cost (CZK thous.): 18 261
Total project cost – TBU (CZK thous.): 2 939
Project cost of TBU in 2014 (CZK thous.): 232

4.6.2 Faculty of Management and Economics

TD020291 Research into the development of professional orientation of students of secondary schools with regard to the parameterization of their further studies and job market
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Zuzana Dohnalová, Ph.D.
Implementation period: 2014 - 2015
Total project cost (CZK thous.): 1 550
Total project cost – TBU (CZK thous.): 1 550
Project cost of TBU in 2014 (CZK thous.): 775

4.6.3 University Institute

TE01020216 Centre of advanced polymer and composite materials
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Tomáš Sedláček, Ph. D.
Implementation period: 2012 - 2019
Total project cost (CZK thous.): 217 500
Total project cost – TBU (CZK thous.): 69 553
Project cost of TBU in 2014 (CZK thous.): 8 949

Projects where TBU acts as a co-investigator

TA01011211 Research and development of functional properties of components of passive safety of automobile vehicle passengers using innovative polymeric materials
Principal investigator: INDET SAFETY SYSTEMS a. s.
Project investigator on behalf of TBU: doc. Ing. Tomáš Sedláček, Ph.D.
Implementation period: 2011 – 2014
Total project cost (CZK thous.): 20 594
Total project cost – TBU (CZK thous.): 3 964
Project cost of TBU in 2014 (CZK thous.): 355

TE02000006 Centre for alternative environment friendly high effective polymer antimicrobial agents for industrial applications
Principal investigator: SYNPO, akciová společnost
Project investigator on behalf of TBU: doc. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2014 - 2019

Total project cost (CZK thous.):	126 650
Total project cost – TBU (CZK thous.):	11 300
Project cost of TBU in 2014 (CZK thous.):	1 300

TA02011308 Hybrid nanocomposites
Principal investigator: SYNPO, akciová společnost
Project investigator on behalf of TBU: doc. Dr. Ing. Vladimír Pavlínek (implemented within CPS and FT)
Implementation period: 2012 - 2014

Total project cost (CZK thous.):	14 847
Total project cost – TBU (CZK thous.):	1 632
Project cost of TBU in 2014 (CZK thous.):	546

4.7 PROJECTS - SUMMARY

The number of projects solved in 2014								
Component part / Provider	Grant Agency of the Czech Republic	Ministry of Industry and trade of the Czech Republic	Ministry of Education, Youth and Sports of the Czech Republic		Ministry of the Interior of the Czech Republic	Ministry of Agriculture of the Czech Republic	Technology Agency of the Czech Republic	Total
			MEYS total	Operational Programme projects				
Faculty of Technology	3*	1	4	4	0	1	4*	13
Faculty of Management and Economics	3	0	3	3	0	0	1	7
Faculty of Multimedia Communications	0	0	0	0	0	0	0	0
Faculty of Applied Informatics	0	0	3	2	1	0	0	4
Faculty of Humanities	2	0	2	1	0	0	0	4
Faculty of Logistic and Crisis Management	0	0	2	1	0	0	0	2
TBU Library	0	0	1	1	0	0	0	1
University Institute	3*	1	9	3	0	1	4*	18
Rectorate	0	0	1	1	0	0	0	1
TBU total	11 *	2	25	16	1	2	9 *	50

Explanatory: * from which 1 project was solved in cooperation FT with UNI

The total cost recognized in 2014 for TBU (in thousands CZK)								
Component part / Provider	Grant Agency of the Czech Republic	Ministry of Industry and trade of the Czech Republic	Ministry of Education, Youth and Sports of the Czech Republic		Ministry of the Interior of the Czech Republic	Ministry of Agriculture of the Czech Republic	Technology Agency of the Czech Republic	Total
			MEYS total	Operational Programme projects				
Faculty of Technology	4 113*	600	3 795	3 795	0	607	2 198*	11 313
Faculty of Management and Economics	1 472	0	20 460	20 460	0	0	775	22 707
Faculty of Multimedia Communications	0	0	0	0	0	0	0	0
Faculty of Applied Informatics	0	0	12 702	8 694	809	0	0	13 511
Faculty of Humanities	880	0	11 042	9 135	0	0	0	11 922
Faculty of Logistic and Crisis Management	0	0	2 898	2 849	0	0	0	2 898
TBU Library	0	0	67	67	0	0	0	67
University Institute	530	640	28 252	26 010	0	1 475	10 604*	41 501
Rectorate	0	0	26 331	26 331	0	0	0	26 331
TBU total	6 995 *	1 240	105 547	97 341	809	2 082	13 577*	130 250

Explanatory: * from which 1 project was solved in cooperation FT with UNI