Annotations of Doctoral Thesis Topics for Degree Course in ''Nanotechnology and Advanced Materials'' for the Academic Years since 2019/2020

Topic: **Adhesion mechanism at the interface rubber-metal**

Tutor: **Dr. Ing. Radek Stoček**

Consultant: **Ing. Ondřej Kratina, Ph.D.**

E-mail: stocek@utb.cz

Annotation:

The PhD thesis is aimed to describe the adhesion mechanism of the metal surface in the interaction with the coating rubber in general as well as directly used for automotive application. In accordance to the function of the metal part, which mainly transfers the high dynamic loading condition applied on the loaded part, the separation of the metal and coating rubber could have a fatal consequence on functionality of complex assembly. Such damage could lead to the change in assembly behaviour, which is fixed over the rubber-metal component to the car, but in the critical case to the total failure of the component. Thus the complex description of adhesion mechanism and its optimisation is of high scientific as well as industrial interest. Experimental part of the work will lead to evaluation of measuring methodology for smart description of rubber-metal adhesion in laboratory scale at quasi-static as well as dynamic loading conditions. From the theoretical point of view, the definition of numerical model of the rubber-metal adhesion will be described and by using of finite element analyse (FEA) implemented in to the calculation of mechanical behaviour of such components. Finally the transfer of the numerical model from laboratory scale to real automotive products will be taken in to the account. In fine the FEA Mode of the rubber-metal bonding with respect to the broad range of loading conditions will be evaluated.

Requirements:

Good knowledge of English, creative abilities, skills for working in physical-chemical laboratory. Working experience with FEM software.

Literature:

1. OZAWA, Kenichi a Kazuhiko MASE. Evidence for chemical bond formation at rubber-brass interface: Photoelectron spectroscopy study of bonding interaction between copper sulfide and model molecules of natural rubber. Surface Science. 2016, 2016(654), 14-19.
2. ŠŮLA, Miroslav. Pojení pryže s kovem. Zlín: ČSPCH. 2007. 63 s. ISBN 978-80-02-01934-3.
3. CROWTHER, Bryan.: The Handbook of Rubber Bonding. Rapra technology LTD. United Kingdom, 2001. 3-97 s. ISDN 1-85957-394-0.