

# JEMNÁ MECHANIKA A OPTIKA

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## Wave number and energetic interpretation of the electron conductance of a thin layer with exploitation of Fermi characteristic quantities (J. Pospíšil, K. Šafářová)..... 31

The present article shows formulations and interpretations of the basic mathematical relations that contain Fermi characteristic quantities and relate to the electron conductance of a homogeneous metallic or semiconducting thin layer. Two approaches to this conductance are chosen, namely from the standpoint of wave number or energetic quantum states of conductive electrons in dependence on their concentration, absolute temperature and acted homogeneous electrostatic field. The theoretical analyses are carried out for drifted and diffused conductive electrons. The relations formulated are of practical importance for development of modern integrated electronical and opto-electronical devices.

## Microscopy study of surfaces in the area of the adhesive interfaces of metal - rubber (J. Krmela, F. Pešlová, M. Müller, L. Hajduchová, V. Tomanová) ..... 37

The paper deals with the tire microstructures – microareas of the adhesive interfaces of steel cord - rubber. Namely attention is dedicated to degraded adhesive interfaces upon corrosion failure. The optical microscope is used for microscopy study of surfaces in the area of the adhesive interfaces of metal - rubber. Knowledge about degradation processes into microareas of the adhesive interfaces is important for process study of ultimate states of wear. Also knowledge about characteristic behaviour is possible to use in creation of complex computational models of tires.

**Keywords:** Tire, steel cord - rubber, microstructure, adhesive interface, microscopy.

## Measurement of Surfaces Topography Created by Longitudinal Cold Rolling (V. Szarková, J. Valíček, M. Vlado, P. Hlaváček, M. Lupták, K. Páleníková, M. Kušnerová)..... 40

In this paper the way of evaluation of sheet steels surface made of cold lengthwise rolling on the sheet rolling mill DUO 210 SVa is presented. The aim is to highlight the link between technological parameters and surface topography. In particular it goes about searching for links between the material reduction to the particular sheet rolling mill and the surface topography. It is also presented the ratio Ra/Rz in terms of surface modifications of rolled material.

## Study of optical properties of nanostructures by scanning near-field optical microscopy (D. Škoda, R. Kalousek, O. Tomanec, M. Bartošík, L. Břínek, L. Šustr, T. Šíkola)..... 42

Optical properties of periodic structures and one-dimensional nanowires have been studied by Scanning Near-Field Optical Microscopy (SNOM). The optical waveguide connected to the tuning fork detector was used for the illumination of the sample or the collection of electromagnetic field close to surface of optically active structures. This contribution presents the ability of new instrument – scanning near-field optical microscope – and the recent results on studied nanostructures.

## Prof. RNDr. Ing. Jaroslav Pospíšil, DrSc.'s anniversary (R. Kubínek) ..... 45

## Application of spectroscopic reflectometry to the study of elasto-hydrodynamic lubrication (V. Čudek, I. Křupka, M. Hartl)..... 46

Paper deals with the application of spectroscopic reflectometry for the central lubrication film thickness measurement in elasto-hydrodynamic contacts. This approach overcomes the main limitations of other measurement techniques used for film thickness measurements in tribological problems studies and provide absolute data that eliminates the relative comparison between calibration table and measured lubrication film.

## Sensitivity analysis of optical parameters fitting procedure

(J. Spousta, J. Zlámal, M. Urbánek, T. Běhounek, R. Pišek, R. Kalousek, T. Šíkola)..... 48

Article deals with a sensitivity analysis of fitting procedure: theoretical model of reflectance is fitted to an „ideal“ data by applying Levenberg - Marquardt algorithm in order to determine optical properties, their accuracy and reliability factor used to quantify a convergence successfulness of the reflectance model at given set of starting parameters vector.

## Review of Interkamera 2009 exhibition (M. Křížek)..... 52

## Source of magnetic field for dark mode spectroscopy

(F. Staněk, M. Lesňák, J. Pištorá) ..... 54

The paper is focused into the research of distribution (2D) of magnetic field for analysis of samples with magnetic active films during the measurement of dark mode spectroscopy (DMS). In shortness is here described construction of the electromagnet and modelling of its magnetic field.

**Keywords:** planar waveguide structure, prism coupling, dark mode spectroscopy, magnetic field.

## ELECTROMAGNETIC AND ACOUSTIC EMISSION SIGNALS FREQUENCY TRANSFORMATION ISSUES

(T. Trčka, P. Koktavý)..... 57

Mechanical stress application leads to micro-crack formations in stressed solid dielectric materials. Generation of these cracks is accompanied by generation of the electromagnetic (EME) and acoustic (AE) emission signals. These signals can be measured and processed by means of the suitably designed measuring installation. According to the obtained EME signals waveform shape, signals may be divided into several specific groups. One of these group is characterized by the damp quasi-harmonic waveforms of EME signals. In this special case, the crack walls make this characteristic type of moving, after the crack opening. It is possible to make the spectral analysis of these signals, which can bring the other important information about the crack generation and evolution. This article deals with the problems related with the spectral analysis of these noise non-stationary signals and also offers the methodics designed just for this specific signal groups.

**Keywords:** Micro-cracks, EME, AE, spectral analysis, PSD, MATLAB.

## From technical library (I. Brezina) ..... 59

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