

JEMNÁ MECHANIKA A OPTIKA

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Laser beam of the infrared pulsed Nd:YAG laser was used to re-melting PVD (Physical Vapour Deposition) coatings on the steel substrates. Processing parameters such as pulse energy, pulse length and frequency were optimized according surface temperature. Multimode beam diameters about some millimetres were computed and adjusted in the suitable distance from focus plane. High laser power re-melting decreases their porosity, increases adhesion to basic material. In case of high laser energy gas vapours escape from basic material and cause fissures, re-melted surfaces have to be carefully controlled. New approach to evaluation of the quality surface structure was realized by laser confocal microscopy. Direct measuring or 3D surface model is possible with resolution less than hundred nanometres, depressions along laser beam path or rises on the laser spot edges were determined. Particles and grains with dimensions about one micron in re-melting structures can be observed better then by optical microscopy. Parallel measurements of the surface roughness were realized by the contact inductive profilometer Talysurf, collected data were displayed by software tool Talymap in a plane or spatial pictures.

Keywords: PVD - coatings, laser, re-melting, confocal laser microscopy, inductive profilometer.

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Measurement of the polyethylene liner wear of the extracted total knee substitute (V. Havránek, J. Gallo)..... 316

Total knee arthroplasty (TKA) is the most effective therapy for end-stage osteoarthritis. However, similarly as in total hip arthroplasty, the weakest point of TKA is polyethylene liner undergoing wear during the time of service. Polyethylene debris deliberated from damaged surface triggers adverse host response that results in bone resorption and aseptic loosening. The paper presents introduction into a theory of measurement of knee polyethylene liners which is followed by evaluation of their basic characteristics using mechanical contact methods. In addition, gravimetric method is briefly mentioned.

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Mowing machine material feed rate measurement under laboratory conditions (F. Kumhála, M. Kroulík, V. Prošek)..... 331

The main objective of this research was to evaluate two possibilities

of material feed rate measurement of modern mowing machines equipped with a conditioner. A mowing machine with finger conditioner was equipped with an electronic measuring unit for the purpose of our measurements. The mowing machine's conditioner shaft was supplied with strain gauges placed on a torque-meter and with a RPM optical sensor counter. Together with torque-meter the mowing machine was equipped with a curved impact plate mounted on the machine's material output. Laboratory measurements with the aim to obtain the information about the dependence of conditioner power input and signals from the impact plate on material mass flow were arranged. A mixture of grass and alfalfa was used. The measurements carried out proved that a very good linear relationship existed between the conditioner's power input, output frequency of the apparatus measuring impact force by means of the impact plate, and material feed rate through the mowing machine. The calculated coefficients of correlation were about 0.95. It is possible to differentiate a material feed rate difference $0.5 \text{ kg}\cdot\text{s}^{-1}$ using both methods. This accuracy should be sufficient for practical utilisation such as creating yield maps.

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ANOTACE

Určenie tvaru ohybového kmitania vzorky s konštantným prierezom (G. Varga, I. Štubňa, A. Vážanová, R. Podoba, A. Trník)..... 334

V článku je uvedených päť metód na určovanie rezonančnej frekvencie ohybového kmitania vzorky. Na určenie frekvencií je použitá zjednodušená parciálna diferenciálna rovnica. Pre neznámu vzorku a materiál je najvhodnejšou metódou na určenie rezonančných frekvencií metóda Lissajousových obrazcov. Pre vzorky so známym modulom pružnosti môže byť použité porovnanie frekvencií základného a prvého módu, alebo výpočet rezonančnej frekvencie pomocou vzoriek rôznych rozmerov.

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