

PhD course KDIT50 – SZTE – TTIK - Kémiai Doktori Iskola

Solid state surfaces and nanoparticles for the high technology

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Scope and thematic

The aim of the course is to show that how special physical and chemical properties of the solid state surfaces and the nanoparticles supported on them can be exploited for different high-tech applications. It is an important aspect that the students recognize the close relationship among the fields like the theory of single crystal surfaces and nanoparticles, the applications of electron- and photoelectron spectrometry and scanning atom probe methods, the contribution of ultrahigh vacuum and ultrathin layer technology. Based on all of these, we present high-tech applications in the field of heterogeneous catalysis, anticorrosion procedures, machine tool industry, nanoelectronics and other several extreme fields (astronomy, space industry, robotics, biomedical sciences). The following lectures are planned:

- (1) A short history of the surface science and its role in recent high technology;
- (2) Most important methods capable for the characterisation of solid state surfaces;
- (3) Basic knowledge on single crystal surfaces and nanoparticles;
- (4) Concept of reduced dimensional (0D, 1D, 2D) materials;
- (5) Special quantum-chemical properties and simulations of nanoparticles and surfaces;
- (6) From micro- to nanoelectronics;
- (7) Development in solar cell production and in energy storing;
- (8) Development light source production;
- (9) Reduced dimensional materials for the biotechnology;
- (10) Implications in astronomy, space industry, robotics;
- (11) Contribution of the artificial intelligence (AI) to the high technology;