LUBELSKI ODDZIAŁ
POLSKIEGO TOWARZYSTWA CHEMICZNEGO

serdecznie zaprasza na wykład

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zatytułowany

“Colloidal Force Microscopy: Novel Technique for Mapping Charge-Mosaic Surfaces in Electrolyte Solutions”

Wykład odbędzie się w środę 30 kwietnia 2008
o godzinie 13:00 w sali M w budynku Małej
Chemii, Wydział Chemii UMCS,
Pl. M.C. Skłodowskiej 2

Prof. UMCS Anna Deryło-Marczewska
(Przewodnicząca Lubelskiego Oddziału PTChem)
ABSTRACT

The atomic force microscope (AFM) is a versatile instrument that provides topographic images of surfaces with nano-scale resolution and measures the interaction forces between a probe and a substrate at sub-micron distances. In aqueous solutions, the probe and the substrate interact through colloidal forces. According to the classical DLVO theory, the colloidal interactions include van der Waals and electrostatic forces. Both magnitude and range of van der Waals forces can be predicted based on the Hamaker constant of the probe, substrate, and intervening liquid. Also electrostatic forces can be calculated if both the solution chemistry of the intervening liquid and surface potentials (or surface charge densities) of the interacting surfaces are known. The composition of the intervening liquid is needed to calculate the thickness of the electric double layer (Debye length). Since most applications/experiments involve aqueous electrolyte solutions of known ionic strength, the electric double layer thickness can be calculated based on the concentration of electrolytes. Surface potentials, on the other hand, are unpredictable for most of the systems and must be measured experimentally. In our research, we determine the surface charge density and surface potential from AFM-measured colloidal forces. Recently, we have furthered this technique to materials with heterogeneous surfaces and examined the tip-substrate colloidal interactions at multiple locations. The measurements of colloidal forces at multiple locations allows for mapping of the size and distribution of surface domains of varying surface charge. In this study, the colloidal force measurements were performed on multi-phase rock samples and Athabasca bitumen. Due to changes in elemental composition, different phases represent surface domains of different surface potential. This discussion will focus on the distribution of surface charge and surface potential across different phase boundaries.

Bio: Jaroslaw Drelich received his BS degree in Chemistry and his MS degree in Chemical Technology from the Technical University of Gdansk (Poland). Jaroslaw earned his Ph.D. degree in Metallurgical Engineering from the University of Utah in 1993. He came to Michigan Tech in 1997 and currently holds the position of Associate Professor of Materials Science and Engineering. His main interest is in applied surface chemistry, colloid science and interfacial engineering for materials processing, fabrication, recycling, and characterization as well as processing of minerals. Some of Dr. Drelich’s current fundamental research activities include adhesion and colloidal force measurements for fine particles using atomic force microscopy. Aside from teaching courses at Michigan Tech on scanning probe microscopy, scanning electron microscopy, materials characterization, and surface chemistry, Dr. Drelich has published over 120 technical papers, holds 8 patents and has accredited more than 40 conference presentations.