高分子学会九州支部外国人学者講演会

High-Resolution Visualization and Probing of Local Electrical Properties of Different Materials with Atomic Force Microscopy

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主催：高分子学会九州支部、G-COE「未来分子システム科学」
共催：九州大学　高分子機能創造リサーチコア, JST,ERATO　高原ソフト界面プロジェクト
日時：2010 年 4 月 19 日（月）13:00-15:00
場所：九州大学伊都キャンパス総合学習プラザ　１階　工学部第９番講義室

Magonov 博士は、AFM の開発時からその高分子材料への応用に注目し、構造観察のみならず物性測定への応用展開を報告されてきた著名な研究者です。この度、日本を訪問される機会に、高分子学会九州支部主催の講演会を開催いたします。多数ご出席下さいますようご案内申し上げます。

Atomic Force Microscopy (AFM) allows high-resolution visualization of surface structures and probing local mechanical and electrical properties of different materials in various environments. Recent advances in high-resolution imaging and applications of Kelvin Force Microscopy (KFM) will be reviewed in the presentation. The high-resolution AFM imaging of soft materials (biological specimens, polymers, etc) down to the level of single macromolecules is one of most exciting capabilities of this technique. Different issues of high-resolution imaging (a choice of the operational mode, imaging parameters, probes, etc) will be discussed and illustrated by practical examples. Visualization of fibrinogen molecules and fibrin fibrils will be considered in more details. Surface potential images, which are recorded in single-pass KFM, help in identifying the surface locations with different electrical properties. These images reveal the variations of work function in the incomplete metallic alloys and the changes of dopant concentration in the semiconductor structures. In case of organic samples and polymer materials the variations of surface potential are often attributed to strength/orientation of molecular dipoles and presence of local charges at molecular and larger scales. Examples of KFM imaging of metal alloys, semiconductors, self-assembled organic systems with molecular dipoles will be discussed. Among the examined materials are also conducting PEDOT:PSS blends, Nafion™ membranes, blends and block copolymers of polystyrene and polymethylmethacrylate.

Dr. Sergei Magonov was educated in the former USSR where he got his PhD and has conducted research on polymers in the RussianAcademy of Sciences. In 1988 Dr. Magonov moved to Germany (Freiburg University) where he started to apply first scanning tunneling microscopy (STM) and later atomic force microscopy (AFM) to different materials. The scientific results obtained in this period were summarized in the book (written jointly with Prof. M. Whangbo) “Surface Analysis with STM and AFM”, VCH Weinheim 1996. In 1995 Sergei joined Digital Instruments－ the leading manufacturer of the scanning probe microscopes where he was involved in development of various AFM applications to soft materials. After spending 12 years with Digital Instruments/Veeco Instruments he moved in 2007 to Agilent Technologies－ another manufacturer of scanning probe microscopy, where he is continuing research in AFM. He is the author of 13 chapters/reviews and 175 per-review papers.

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