大学院集中講義・開講案内

科目名：　物理化学特別講義 Ⅰ　(1単位)
授業番号：　理工学研究科　博士前期課程 R327,　博士後期課程 R328
　　理学研究科　　博士前期課程 R0327,　博士後期課程 R0328

題目：　**Models for collisions involving atoms, molecules, and clusters**
講師：　Prof. Henning Zettergren (Department of Physics, Stockholm University)

日時・教室：　2019年2月14日(木)　3-4限　8号館 303教室
　　2019年2月15日(金)　3-4限　8号館 303教室
　　2019年2月19日(火)　3-4限　8号館 303教室
　　2019年2月20日(水)　3-4限　8号館 303教室

講義概要：

This course introduces models for describing collisions between two particles where at least one of them is positively or negatively charged. These models are designed for collision energies in the meV to keV range and for collision partners varying in size from single atoms to clusters containing hundreds of atoms. Typically, the clusters consist of metal atoms, noble gas atoms, or molecules where the bonds between the individual molecules are much weaker than within the molecules themselves. Examples of the latter are Polycyclic Aromatic Hydrocarbons (PAHs) and fullerenes (C_{60}), which are believed to be key players in e.g. various astrophysical environments.

The course will start off by introducing models for long-range interactions. These include classical over-the-barrier models for estimating charge transfer cross - sections in keV ionic atom-atom, atom-molecule, atom-cluster, and cluster- cluster collisions. Furthermore, models for low energy (down to meV) collisions will be treated such as the Landau-Zener model for determining final state distributions following charge transfer reactions and models for determining compound formation reaction rates (Langevin-type reactions). These will be followed by models designed to describe short-range interactions where energy is deposited to molecules or clusters through Rutherford-type scattering processes to the individual nuclei (nuclear stopping) and/or directly to the electron cloud (electronic stopping). Such collisions typically leave the molecules and clusters with high internal energies. They may then relax through various competing processes including fragmentation, electron emission, radiative cooling, and isomerization. Statistical models for describing such processes will be discussed. For instance models based on a detailed balance approach. Finally, classical molecular dynamics simulations will be introduced. Here the focus will be on describing energy transfer and fragmentation dynamics driven by nuclear stopping processes.

講師紹介：
H. Zetttergren教授はStockholm大学の出身で，原子・分子・クラスターの衝突ダイナミクスに関するシミュレーションを専門とする理論物理学者です。原子物理実験グループに所属して実験データに直結した理論計算を行っていますので，理論と実験の両方を熟知しています。原子レベルで理解する物理と化学の幅広い分野に関係した講義になると思います。

履修申請は2月6日(水)までに理学系教務係で済ませて下さい。

問合せ先：　原子物理実験研究室　田沼 肇 (ext. 3355)