Contribution ID: **50** Type: **oral**

Fast ion collisions with large molecules of biological relevance

Monday, September 19, 2016 10:00 AM (20 minutes)

Collisional interaction of fast ions with large biomolecules, PAH and fullerenes is an active field of research which is not only important for the development of theoretical models for collisional aspects in many body systems but also for its application towards the modeling of radiation damage and astrophysical absorption spectrum in VUV region. There has been some distinct progress in the study of ionization and fragmentation of large biomolecules in last decade. This progress is reflected in experiments as well as in the theoretical modeling. The secondary electron emission from nucleobases and water is an important parameter to estimate the radiation damage caused by the fast ions. Besides keV and a few MeV protons, we have recently pushed this field by using highly charge heavy ions (C, O, F and Si) as projectiles in the energy range of ~100 keV to ~100 MeV i.e. across the Bragg peak of energy loss. A recently installed 14.5 GHz ECR based ion-accelerator on 400 kV deck and the existing 14 MV Pelletron tandem accelerator in TIFR, Mumbai are being used to investigate these aspects. The targets are uracil, bromouracil and adenine, besides water molecule. In particular the angular distribution and angular asymmetry in the electron double differential cross sections and total ionization cross section in case of water [3,5] or biomolecules provides a very crucial input regarding the many-body aspects. The dramatically large forward backward asymmetry in electron emission for uracil compared to small molecules indicates some kind of many-body or size effect. Many body effect, such as a collective plasmon resonance has been observed in C-based molecules, coronene and fullerene and such plasmon resonance accounts for nearly half of the ionization yields. The best known quantum mechanical model although comes closer to the water data at high energies, at intermediate energies it fails. Inclusion of transfer-ionization mechanism improves the agreement with a suitable scaled model. A large and unusual enhancement in e-emission from a BrU bio-molecule over uracil has also been quantitatively determined now. The detailed data for these molecules has been used to develop a scaling rule of ionization cross section for water and uracil in terms of velocity and charge states, which will have input for the model calculation for radiation damage at hadron therapy. Details will be presented based on the results in our group along with some occasional references from the work done elsewhere.

e-mail: lokesh@tifr.res.in; ltribedi@gmail.com

Primary author: TRIBEDI, Lokesh (Tata Institute of Fundamental Research, Mumbai, India)

Presenter: TRIBEDI, Lokesh (Tata Institute of Fundamental Research, Mumbai, India)

Session Classification: Biomolecular and Astrophysical Applications