

A beamline for gas phase science at Fermi

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A consortium of users of synchrotron light has proposed the construction of a beamline at the Femi light source to perform experiments on low density matter. This proposal has been approved by the Fermi review panel and my presentation will describe some of the science planned. The major themes of the project may be classed as non-linear VUV optics, pump-probe experiments, cluster spectroscopy and the structure of the biomolecules (flying proteins). The first theme will use the light of Fermi to perform pioneering experiments in an energy range which is not accessible to conventional lasers because of the high energy and peak power required. Examples are the two photon absorption and two photon double photoionization spectroscopy of helium. With pump-probe experiments it will be possible to probe the dynamics of chemical reactions on the time scale provided by Fermi (femtoseconds) and to perform a range of new experiments: snapshots of reactions, spectra of excited species, and complete determination of the internal energy in a photolysis reaction. Free clusters are a very low density form of matter (between large molecules and small solids) and are increasingly important as a method of making nanostructured products. The project includes a number of innovative methods for analysing free clusters. Lastly the “flying proteins” experiment will focus the light of Fermi on free proteins to study the secondary (folding) structure of proteins and large molecules. These “molecular elephants” which have been given “electrospray wings” (to quote the Nobel Laureate John Fenn) will be analysed in detail to understand their properties.