LARGE PENETRATION DEPTH OF F ATOMS COMBINED WITH ACCUMULATION AND DETECTION IN RARE GAS INTERFACES

N. SCHWENTNER, C. BRESSLER, M. DICKGIESSER, *Fachbereich Physik, FU Berlin, Arnimallee 14, D-14195 Berlin, Germany*.

The penetration depth of photomobilized F atoms is studied by a sandwich experiment using a stack of three rare gas layers. In the top layer photomobile F atoms are prepared, the spacer layer of variable thickness serves as a drift distance and the bottom layer is used for detecting the penetrating atoms. F atoms with a mean kinetic energy of 4.3 eV are generated in the top layer by photodissociating F_2 with 10.15 eV on a repulsive potential surface and ejected into the spacer layer composed of either Ar or Ne. F atoms arriving at the interface between the spacer layer and the Kr detection layer are identified by the characteristic $Kr_2{}^+F^-$ emission and its intensity after complete F_2 dissociation delivers the amount of penetrated atoms. The F atom content at this inerface is kept below 1/20 of a monolayer by exploiting energy transfer from Kr excitons. The penetration depths of about 10 monolayers are similar for Ar and Ne matrices and show no distinct dependence on temperature. They exceed those for F^+ and F^- ions by an order of magnitude, but are in accordance with those molecular dynamics calculations which predict a rectilinear motion in channels of the lattice. The penetration depth delivers an upper limit for the average length of travel of 14 monolayers and is consistent with a mean free path between large angle scattering collisions of 4 monolayers and less than 7 collisions per trajectory. The synchrotron radiation set up providing the VUV photones has been complemented with an FTIR spectrometer with a beam path which uses the same mirror for imaging at the sample and thus guarantees a coincidence of the irradiated volumes by VUV and IR light. Results for transients will be presented with a special emphasis on reactions of F atoms at the interface with molecules condensed in this interface.