

Kapitel 6

Abstract

The interaction of low-energy electrons (<20 eV) with single molecules M (M=C₂F₅I, C₂F₅Br, C₂F₃I, C₃F₃H₃, CF₂Cl₂, CF₂BrCl and CF₂Br₂) and their van der Waals-clusters M_m is studied by means of electron-molecular crossed beam experiments coupled to mass spectrometry. The following results are obtained:

- Dissociative electron attachment to single molecules leads to different negatively charged fragments X⁻. Electron attachment to clusters additionally generates solvated anions X⁻·M_n as well as undissociated complexes M_n⁻ that include the stabilization of the monomeric anion. By increasing the partial pressure of the argon carrier gas, ternary products of the form X⁻·M_n·Ar_k can be also observed.
- At very low energies, the precursor anion of C₂F₅I^{-#} undergoes unimolecular dissociation into I⁻ and C₂F₅. Analysis of excess energy distribution of the negative fragment indicates that 66% of the available excess energy contribute to translational energy and 34% to internal energy of the radical. Modelling the radical species as a rigid rotator, the internal energy is redistributed to rotation (15% of the total excess energy) and to vibration (19%).
- The solvated anions are found to be more abundant than the undisso-

ciated complexes. This mirrors the reaction pathway within the femto- to picosecond time frame after electron localization in the target cluster indicating that dissociation is preferred over collisional stabilization. In the case of $(\text{C}_2\text{F}_3\text{I})_m$ -clusters stabilization prevails on decomposition.

- At higher energies, solvated anions arise from inelastic electron scattering processes (self scavenging) in $(\text{C}_2\text{F}_5\text{I})_m$ -clusters.
- Electron attachment to $(\text{C}_3\text{F}_3\text{H}_3)_m$ clusters shows a strong enhancement of dissociative cross section at incident electron energies below 2 eV, while under single collision conditions, autodetachment process overtakes that of dissociative decay.
- Different products are detected indicating that intra-cluster polymerization reactions in $(\text{C}_2\text{F}_3\text{I})_m$ and $(\text{C}_3\text{F}_3\text{H}_3)_m$ induced by low energy electrons take place.