SPECTROSCOPIC DETERMINATION OF CHARGE TRANSFER PROBABILITIES IN DOPED HELIUM DROPLETS

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In electron impact mass spectrometry of species embedded in helium droplets, the ionization of the neutral dopant is thought to occur by a mechanism in which a He^+ is formed by the electron impact and then rapidly "hops" until a He_n^+ ion is formed or the He^+ transfers the charge to the dopant species. Measuring the charge transfer probabilities from this "hopping" is difficult in conventional mass spectrometric methods because of the contributions to the mass spectrum from empty droplets, background impurities, pickup of multiple impurities and fragmentation of multimer species[a]. Using a novel infrared spectroscopic technique we are able to measure the charge transfer probabilities without these complications. The influence of the dopant size, dipole moment and polarizability, as well as that of the droplet size, on the charge transfer probability are examined and compared to simple models for the charge migration.

[a]T. Ruchti, K. Förde, B. E. Callicoatt, H. Ludwigs, and K. C. Janda, J. Chem. Phys., 109, 10679 (1998).