Ultralow Energy Electron Attachment at Sub-Millielectron Volt Resolution.
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The technique of rare-gas photoionization has been extended by use of direct laser ionization to electron energies ε in the range 0-100 meV, with a resolution Δε of 0.4-0.5 meV (FWHM). Tunable UV light at λ276 nm is produced using a pulsed Nd:YAG laser and nonlinear mixing techniques. The beam is frequency tripled in a pulsed jet of xenon. The VUV radiation, tunable at λ92 nm, is then used to photoionize Xe at its 2P1/2 threshold (single-photon ionization). The photoelectrons produced interact with admixed target gas to generate negative ions through the s-wave capture process. Recent results in electron attachment to SF6 will be reported which show resonance structure at the opening of the ground-state vibrational channels. This structure corresponds to the process of vibrational excitation + attachment, which is superimposed on the underlying s-wave (direct) capture process. It should be a general phenomenon, present in a wide variety of zero-energy electron attaching molecules.

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