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Thermal electron attachment to fluorocarbon radicals: Experiment and kinetic modeling NICHOLAS SHUMAN, THOMAS MILLER, ALBERT VIGGIANO, Air Force Research Laboratory — Few experimental measurements of the kinetics of electron attachment to radicals exist due to the inherent difficulties of working with transient species. Electron attachment to small fluorocarbon radicals is particularly important, as the data are needed for predictive modeling of plasma etching of semiconductor materials. We have recently developed a novel flowing afterglow technique to measure several types of otherwise difficult to study plasma processes, including thermal electron attachment to radicals. Variable Electron and Neutral Density Attachment Mass Spectrometry (VENDAMS) exploits dissociative electron attachment in a weakly ionized plasma as a radical source. Here, we apply VENDAMS to a series of halofluorocarbon precursors in order to measure the kinetics of thermal electron attachment to fluorocarbon radicals. Results are presented for CF_2, CF_3, C_2F_5, CF_3, 1-C_3F_7, 2-C_3F_7, and C_3F_5 from 300 to 600 K. Both the magnitude and the temperature dependences of rate coefficients as well as product branching between associative and dissociative attachment are highly system specific. The data are analyzed using a kinetic modeling approach, allowing for physical insight into the systems as well as extrapolation to non-thermal conditions inaccessible to the experiment.

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