

Abstract Submitted
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Ion-molecule reactions with CF₃ radical¹ THOMAS M. MILLER, NICHOLAS S. SHUMAN, JUSTIN P. WIENS, JORDAN C. SAWYER, OSCAR MARTINEZ JR., SHAUN G. ARD, ALBERT A. VIGGIANO, Air Force Research Laboratory — The first measurements of reaction rate coefficients and products are reported for reactions of the radical CF₃ with Ar⁺, Xe⁺, O₂⁺, NO⁺, CO₂⁺, and C₂F₅⁺, at 300 K. The work was carried out in a fast flow of typically 1.5 Torr helium buffer gas (4% argon) using the variable electron and neutral density attachment mass spectrometry (VENDAMS) technique. CF₃ was produced via dissociative electron attachment to CF₃I, resulting in CF₃ concentrations that were well-quantified because the plasma diffusion rate, the electron concentration, and the rate coefficient for attachment to CF₃I were separately measured in the experiment. The Ar⁺+CF₃ reaction was found to proceed at nearly the calculated collisional rate coefficient, yielding 90% CF₂⁺ along with CF₃⁺. Reaction of CF₃ with C₂F₅⁺ is slower and yields 75% C₂F₄⁺ along with CF₃⁺. CF₃ undergoes charge transfer reaction with Xe⁺, O₂⁺, NO⁺, and CO₂⁺, yielding CF₃⁺. Arguments will be made regarding reaction mechanisms, including the role of spin conservation. Comparisons with Ar⁺ and O₂⁺ reaction with CH₃ will be made.

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