

Abstract Submitted  
for the GEC07 Meeting of  
The American Physical Society

**Comparison of Ion Chemistries in Octafluoro-2-butene (2-C<sub>4</sub>F<sub>8</sub>) and in Octafluorocyclobutane (*c*-C<sub>4</sub>F<sub>8</sub>)**<sup>1</sup> CHARLES JIAO, ISSI, Dayton, OH, CHARLES DEJOSEPH, ALAN GARSCADDEN, Air Force Research Laboratory, WPAFB, OH — 2-C<sub>4</sub>F<sub>8</sub> is one of the promising candidates to replace *c*-C<sub>4</sub>F<sub>8</sub> that has been widely used for dielectric etching but is not environmentally friendly. In this study we have investigated electron impact ionization and ion-molecule reactions of 2-C<sub>4</sub>F<sub>8</sub> using Fourier transform mass spectrometry (FTMS), and compared the results with those of *c*-C<sub>4</sub>F<sub>8</sub> we have studied previously. Electron impact ionization of 2-C<sub>4</sub>F<sub>8</sub> produces 15 ionic species including C<sub>4</sub>F<sub>7,8</sub><sup>+</sup>, C<sub>3</sub>F<sub>3,5,6</sub><sup>+</sup>, C<sub>2</sub>F<sub>4</sub><sup>+</sup> and CF<sub>1-3</sub><sup>+</sup> as the major ions. The total ionization cross section of 2-C<sub>4</sub>F<sub>8</sub> reaches a maximum of 1.8x10<sup>-15</sup> cm<sup>2</sup> at 90 eV. The ionization is dominated by the channel forming the parent ion C<sub>4</sub>F<sub>8</sub><sup>+</sup> from 12 to 18 eV, and by the channel forming C<sub>3</sub>F<sub>5</sub><sup>+</sup> from 18 to 70 eV. After 70 eV, CF<sub>3</sub><sup>+</sup> becomes the dominant product ion. Among the major ions generated from the electron impact ionization of 2-C<sub>4</sub>F<sub>8</sub>, only CF<sup>+</sup>, CF<sub>2</sub><sup>+</sup> and CF<sub>3</sub><sup>+</sup> are found to react with 2-C<sub>4</sub>F<sub>8</sub>, via F<sup>-</sup> abstraction or charge transfer mechanism. The charge transfer reaction of Ar<sup>+</sup> + 2-C<sub>4</sub>F<sub>8</sub> produces primarily C<sub>4</sub>F<sub>7</sub><sup>+</sup>.

<sup>1</sup>This work is supported in part by the AFOSR.

Charles Jiao  
ISSI, Dayton, OH

Date submitted: 20 Jun 2007

Electronic form version 1.4