

Abstract Submitted
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Formation of positive ions of quadricyclane¹ C.Q. JIAO, Innovative Scientific Solutions, Inc., Dayton, OH, C.A. DEJOSEPH, JR., R.H. LEE, A. GARSCADDEN, Air Force Research Laboratory, Wright-Patterson AFB, OH — Quadricyclane (QC) is one of the strained hydrocarbons that have potential as high-energy density materials used as aerospace fuel or as additives to kerosene rocket fuel. We have studied the formation of positive ions of QC by electron impact and by charge-transfer reactions, using Fourier-transform mass spectrum (FTMS) techniques. The electron ionization cross sections in the energy range of 10-200 eV have been measured. The total cross section reaches a maximum of 2.3×10^{-15} cm² at 60 eV. Parent ion C₇H₈⁺ and 21 fragment ions including C₅H₆⁺ and C₅H₅⁺ that dominate the dissociation channels at low energies (<25 eV) are observed. Ar⁺ charge-transfer reaction with QC produces C₅H₅⁺ and C₇H₇⁺ as the major ionic species. Some selected hydrocarbon ions, i.e., C₃H₃⁺, C₅H₃⁺, C₅H₅⁺ and C₅H₆⁺, which are formed from QC by electron ionization, are found to react with QC forming C₇H₇⁺ and C₇H₈⁺ as the major product ions, while the latter two ions are unreactive with QC. The relative rates of the hydrocarbon ion reactions, compared to the Ar⁺ charge-transfer reaction, are rather low; while the rate for C₃H₃⁺ is less than 20 percent of the Ar⁺ reaction rate, the rates for C₅H₃⁺, C₅H₅⁺ and C₅H₆⁺ are less than 3 percent.

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