

Abstract Submitted  
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**Kinetic Energy Dependence of Endothermic Charge Transfer (KEDECT) in Xenon Ion – Hydrocarbon Collisions** CHARLES JIAO, ISSI, BISWA GANGULY, ALAN GARSCADDEN, Air Force Research Lab — KEDECT has been studied by Fisher and Armentrout (ref 1) who showed clearly the strong influence of modest rare gas ion kinetic energy in opening up dissociative charge transfer channels in silane. Charge transfers of fast xenon ions with  $\text{CH}_4$ ,  $\text{C}_2\text{H}_4$  and  $\text{C}_3\text{H}_8$  are studied using xenon plasma expansion through a small nozzle into low-pressure hydrocarbon gas. Branching ratios and relative reaction rates creating the parent ion and smaller molecular ions are measured under selected power levels of an rf coupled discharge.  $\text{Xe}^+$  reacts with  $\text{CH}_4$  to produce  $\text{CH}_4^+$  (I) and  $\text{CH}_3^+$  (II) in the ratio 1: 0.56 and an estimated rate coefficient  $2.6 \times 10^{-10} \text{ cm}^3/\text{s}$ . The  $\text{Xe}^+(^2\text{P}_{1/2})$  reaction I with  $\text{CH}_4$  is exothermic by 0.83 eV while reaction II is endothermic by 0.88 eV. The  $\text{Xe}^+(^2\text{P}_{3/2})$  reactions with  $\text{CH}_4$  are endothermic by 0.48 and 2.19 eV respectively, however mass-spectrometry of the interaction region shows that the reactions do occur. The xenon plasma expansion can add up to 3 KTe kinetic energy to the ion, permitting the reactions to occur. Results for the other collision partners  $\text{C}_2\text{H}_4$  and  $\text{C}_3\text{H}_8$  are discussed.

[1] Ellen R. Fisher and P.B. Armentrout, J. Chem. Phys., 93, 4858 (1990).

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