REACTION DYNAMICS OF CARBON ATOM

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The reaction of carbon(^{3}P) with chloroform ($CHCl_3$) was studied in a crossed-beam configuration. C(^{3}P) was produced by laser ablation of graphite and its translational energy was varied by seeding in carrier gases to investigate the reaction mechanism in two center-of mass energy regimes: a low-energy regime of 3.21 and 5.28 kcal/mol, and a high-energy regime peaked at 85.2 kcal/mol. The CCl reaction product was probed by laser-induced fluorescence via the $A^2\Delta \leftarrow X^2\Pi$ ($\Delta\upsilon = 0$) transition. It was found that CCl was highly rotationally excited (T_{rot} = 1500 - 1800K) and that the first excited vibrational level was significantly populated, based upon comparisons to spectral simulations. Good agreement was obtained between experimental results and statistical estimations via prior calculations suggesting that the reaction proceeds through a long-lived insertion complex and that the exit channel does not possess a strong angular anisotropy. At higher collision energies, the reaction pathway is believed to either involve a short-lived complex followed by an adiabatic translational energy transfer into fragments, or sample only reactants in the low collision energy regime.