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State-resolved reactive scattering by slice imaging: A new view of the Cl+ethane reaction ARTHUR SUITS, WEN LI, CUNSHUN HUANG, Wayne State University — The reactions of chlorine atoms with alkanes have been the subject of intense scrutiny as model systems for the detailed investigation of polyatomic reaction dynamics. Interest in these systems has accelerated in recent years as new experimental methods have provided the means of gaining insight into the reaction with quantum state specificity. In this presentation, we will show state-resolved crossed beam scattering results for the reaction Cl + C_2H_6 $\rightarrow$ HCl + C_2H_5, obtained using DC slice imaging. The HCl (v=0, J) images, recorded at a range of well-defined collision energies, show strongly coupled angular and translational energy distributions revealing features of the reaction not seen in previous studies. The overall distribution is mainly forward-sideways scattered with respect to the Cl beam, with a translational energy distribution peaking near the collision energy. However, there is a substantial backscattered contribution that is very different. It shows a sharp peak near the energetic limit, but extending to much lower energy, implying substantial internal excitation in the ethyl radical co-product. These results provide new insight into the reaction, and they are considered in terms of alternative models of the dynamics. This work represents the first genuine crossed-beam study in which a product other than the methyl radical was detected with quantum state specificity, showing the promise of the approach generally for high resolution state-resolved reactive scattering.

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