Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Nonadiabatic Electronic and Rotational Energy Partitioning in F + $H_2O \rightarrow HF + OH$ MICHAEL ZIEMKIEWICZ, ALEX ZOLOT, DAVID NESBITT, JILA, University of Colorado — OH product state distributions from F + $H_2O \rightarrow HF + OH$ have been carried out at a COM collision energy of 6(2) kcal/mol. These measurements complement earlier work on the dueterated version of the system (F + $D_2O \rightarrow DF + OD$) where extensive non-adiabatic interactions led to a population of spin-orbit excited OD products despite energetically inaccessible barriers on all but the ground electronic surface. In the present F + H_2O measurements, the branching ratio is, within error bars, the same as in the deuterated case: 69(1)% of the molecules are found in the ground spin-orbit state, and 31(1)% are found in the excited (nonadiabatic) state. In contrast to this isotopomer-independent electronic branching ratio, the rotational distributions for this system are distinctly different from the deuterated case. A detailed analysis of the rotational distributions for the title reaction leads to an estimate of the vibrational distribution of the unobserved HF fragment (v=2:v=1) of 3:1. The fact that isotoperization dramatically changes the rotational distributions while leaving electronic distributions unchanged sheds light on the important question of how and where nonadiabatic transitions take place in this four-atom system.

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Date submitted: 02 Dec 2006

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