Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

**Cold collisions of complex polyatomic molecules** ZHIYING LI, ERIC HELLER, Deparatment of Physics, Harvard University — We introduce a method for classical trajectory calculations to simulate collisions between atoms and large rigid asymmetric-top molecules. Using this method, we investigate the formation of molecule-helium complexes in buffer-gas cooling experiments at the temperature of 6.5 K for molecules as large as naphthalene. Our calculations show that the mean lifetime of the quasi-bound collision complex is not long enough for the formation of stable clusters under the experimental conditions. Our results suggest that it may be possible to improve the efficiency of the production of cold molecules in buffer-gas cooling experiments by increasing the density of helium. In addition, we find that the shape of molecules is important for the collision dynamics where molecular vibrational motions are frozen. For some molecules, it is even more crucial than the number of accessible degrees of freedom. This indicates that by selecting molecules with suitable shape for buffer-gas cooling, one could cool molecules with a very large number of degrees of freedom.

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Date submitted: 09 Nov 2011 Electronic form version 1.4