AN ENERGY RESOLVED, TRANSLATIONALLY COLD MOLECULAR BEAM FOR COLLISIONAL STUDIES

LASZLO C. SARKOZY, FRANK C. DE LUCIA, *Department of Physics, The Ohio State University, Columbus, OH 43210-1106, USA*.

We have been interested for some time in low energy (~1-10 Kelvin) molecular collisions which lead to the formation of quasibond states. In order to circumvent the limitations ordinarily imposed by vapor pressure, we have previously developed and exploited a quasi thermal equilibrium technique, collisional cooling. However, because it is a thermal technique, the thermal average broadens the energy resonances associated with these processes. In order to remove this average, we have developed a time-of-flight system based on a collisional cooling source and a fast see-through valve that produces translationally cold neutral molecule packets. Pulse widths less than 1ms (an energy resolution of less than 10%) and translational energies down to 8 Kelvin have been achieved. A quadrupole state selector directs the pulses into oriented beams. A microwave Fabry-Perot cavity tuned to the J=1, K=1 inversion line of ammonia and a quadrupole mass spectrometer are used for detection.