ENERGY TRANSFER IN HBr + HBr AND HBr + He COLLISIONS

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Optically pumped HBr lasers, operating on ro-vibrational transitions of the ground state, are currently being developed for high-energy laser applications. State-to-state energy transfer rate constants are needed for modeling and computational optimization of these systems. Self-collisions and collisions with He are of interest. The latter is used for pressure broadening, to help match the absorption lines to the spectral characteristics of the solid-state pumped lasers. IR-optical double resonance techniques are being used to determine rotational energy transfer rate constants. A tunable IR laser is used to excite the lines of the 2-0 vibrational overtone transition, and a UV laser probes the $v = 2$ rotational manifold via 2+1 REMPI of the $H^1\Sigma^+$ - X transition. For comparision with the HBr + He results we have also carried out first principles scattering calculations to predict the rate constants. Both the experimental results and theoretical calculations will be presented.