Modeling collisions between gases and laser-cooled atoms for Cold-Atom-Vacuum-Standard devices

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New pressure standards for Ultra-High-Vacuum devices are being developed at the National Institute of Science and Technology. These devices rely on ensembles of trapped, laser-cooled Li or Rb atoms at micro-Kelvin temperatures. They will allow measurements of extremely low UHV pressures, for which current pressure sensors are not reliable. Trapped cold atoms come into contact with residual room-temperature atomic and molecular gases in the vacuum system, which results in cold atom losses. Therefore, one needs detailed knowledge of collisional rate coefficients. We present results of quantum scattering calculations using high-quality *ab initio* potential energy surfaces computed with the current gold-standard coupled-cluster method. We find temperature-dependent elastic rate coefficients between cold Li and Rb and room-temperature He, Ne, Ar, Xe and molecular nitrogen. The quantum scattering calculations are performed by solving coupled-channel equations for collision energies necessary to converge rate coefficients up to a temperature of 400 K. We also estimate uncertainties of the elastic rate coefficients associated with the error in the *ab initio* potentials.