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Non-Reactive Atom-Molecule Scattering in Support of a Cold-Atom Based UHV Pressure Sensor CONSTANTINOS MAKRIDES, Joint Quantum Institute, EITE TIESINGA, Joint Quantum Institute, National Institute of Standards and Technology, Giathersburg, MD — The operation of a cold-atom vacuum sensor depends critically on the ability to characterize the collision between background gases in the vacuum with trapped sensor atoms, whose ejection from a shallow trap within the vacuum can be mapped to the pressure of the vacuum. The target pressure ranges are fully within the Ultra-High Vacuum (UHV) and into the Extreme-High-Vacuum (EHV) regime, where presently there is a lack of a primary standard. The effect of background molecules on the lifetime of trapped ultracold atoms was estimated in early experiments with ultracold gases; However, exact knowledge of the collisional properties between the constituents might prevent the realization of a cold atom vacuum sensor. Our goal here is to compute these key atom-molecule scattering properties by solving the coupled channels equations. We use H_2 and lithium as the constituents in our calculations, as H_2 is the most abundant molecule to be found in a vacuum and lithium is currently being utilized as a sensor atom in a realization of such a device at NIST. Specifically, we will show the cross-sections and thermalized rate for this collision pair with careful attention to the uncertainties in our approach.

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