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Formation of Alkali Hydrides via Two-photon Excitation ELIZABETH JUARROS, University of Connecticut (Storrs, CT 06269), KATE KIRBY, Institute for Theoretical Atomic, Molecular, and Optical Physics (Cambridge, MA 02138), ROBIN CÔTÉ, University of Connecticut (Storrs, CT 06269) — Alkali hydride molecules are very polar, exhibiting large ground-state dipole moments. Ultracold sources of alkali atoms and hydrogen have been created in the laboratory. We explore theoretically the feasibility of forming such molecules from a mixture of the ultracold atomic gases, employing a two-photon stimulated radiative association process – Raman excitation. The triplet ground state for lithium hydride is of particular interest since it supports only one bound ro-vibrational level. Using accurate molecular potential energy curves and dipole transition moments, we have calculated the rate coefficients for populating the bound ro-vibrational level of the $a^3\Sigma^+$ state of LiH via the excited $b^3\Pi$ state. We have found that significant molecule formation rates can be realized with laser intensities and atomic densities that are attainable experimentally. Also, we have calculated the rate coefficients for populating all the vibrational levels of the $X^1\Sigma^+$ state of LiH via the excited $B^1\Pi$ state. In this case, we have found that significant formation rates into the upper vibrational levels can be realized. We examine the spontaneous emission cascade which takes place from these upper vibrational levels on a timescale of milliseconds, and calculate the resulting rotational populations in $v = 0$. We show that photon emission in the cascade process does not contribute to trap loss.

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