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Ultracold Molecule Assembly with Photonic Crystals JESUS PEREZ-RIOS, MAY KIM, CHEN-LUNG HUNG, Department of Physics and Astronomy, Purdue University, West Lafayette, Indiana 47907, USA — We present a viable experimental scheme for ultracold molecule assembly in a tailored nanophotonic environment. In particular, a photonic crystal waveguide is specially designed to trap an array of cold atoms and induce strong radiative coupling between the photoassociated, molecular excited state with the desired metaestable or ground molecular state, thereby greatly enhancing radiative decay probability into the selected ground molecular state after photoassociation. We propose to use a single-step photoassociation scheme to convert free atom pairs directly into the deeply-bound molecular ground state with near unity conversion efficiency and with high production rate. These ground state molecules will remain trapped along the nanophotonic structure, which can then serve as an efficient light-molecule interface, opening up the possibility to coherently address the internal levels of trapped molecules and perform state-sensitive, non-destructive molecule detection for future quantum applications.

Jesus Perez-Rios
Purdue University

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