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Coherent control in hybrid materials<sup>1</sup> CHAO TIAN, Stevens Institute of Technology, MAXIM SUKHAREV, School of Letters and Sciences, Arizona State University, SVETLANA MALINOVSKAYA, Stevens Institute of Technology — A quickly growing field of hybrid materials is emerging on the base of latest advancements in nanoplasmonic science. Here one merges plasmonics with atomic and molecular physics considering systems comprised of quantum emitters and metal nano-structures. Such systems exhibit a wide variety of new phenomena. It has long been realized that quantum control could be successfully applied to optically active nano-systems. In this paper we explore the ideas of stimulated Raman adiabatic passage (STIRAP) applied to ensembles of atoms optically coupled to plasmonic systems. We demonstrate the implementation of STIRAP as a tool to control scattering, reflection, and transmission properties of hybrid systems. As an example we consider a core-shell silver nanowire with resonantly coupled layer of three-level atoms. A self-consistent model of Maxwell-Liouville-von Neumann equations is implemented that allows taking into account the collective effects between atoms. We show that both linear and nonlinear optical properties of atomic ensembles may be controlled by coupling to plasmonic nano-structures.

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Chao Tian Stevens Institute of Technology

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