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Electromagnetically-induced transparency with Cu_2O Rydberg excitons in the presence of phonon coupling VALENTIN WALTHER, Harvard - Smithsonian Center for Astrophysics, PETER GRUENWALD, THOMAS POHL, Aarhus University — Rydberg excitons in Cu_2O have emerged as a platform of strongly interacting atom-like particles with great potential for both fundamental phenomena as well as optical applications. A central problem is a strong absorptive background underlying the spectrum, stemming from the excitons' coupling to optical phonons and constricting the effect of exciton interactions. Here, we analyze how and under which conditions electromagnetically-induced transparency (EIT) can suppress this background. We investigate the optical response in two-photon absorption as a function of yet unknown system parameters. Depending on these parameters, the background and exciton spectrum can partially or even fully be separated, essentially switching off the coupling to the phonon dynamics. This procedure also provides a direct handle on the experimental determination of these quantities and places limits required for optical applications. Our findings pave the way for the exploitation of Rydberg blockade with Cu_2O excitons in EIT setups.

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