

Abstract Submitted  
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**Strong Coupling of Molecular Absorption and Mid-Infrared Metamaterial Resonances** JOSHUA MASON, University of Massachusetts, Lowell, GRAHAM ALLEN, Connecticut College, VICTOR PODOLSKIY, University of Massachusetts, Lowell, DANIEL WASSERMAN, University of Illinois, Urbana Champaign — Here we present numerical, analytical, and experimental evidence for strong optical coupling between a mid-infrared perfect absorber thin-film metamaterial and a molecular absorption resonance within a dielectric medium. Clear anti-crossing behavior is exhibited numerically and experimentally when the metamaterial resonance is scanned through the dielectric molecular resonance; a coupled oscillator model is used to present a further analytical description. The anti-crossing is used to demonstrate and quantify the strength of the optical coupling within the thin film. Such a device can potentially be developed for mid-infrared sensing applications and actively tunable metamaterial optical components.

Joshua Mason  
University of Massachusetts, Lowell

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