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Effects of relative phase between coupled vibrational modes in CARS microscopy VISHESHA PATEL, Stevens Institute of Technology, VLADIMIR MALINOVSKY, MagiQ Technologies, SVETLANA MALINOVSKAYA, Stevens Institute of Technology — Coherent anti-Stokes Raman scattering has emerged as a promising tool for noninvasive imaging of biological spices and many other biological applications. The rich spectrum obtained from CARS contains the vibrational signatures of the molecules, that can be used for molecular specific structure imaging. Main obstacles in this technique are the non-resonant background as well as the lack of selectivity. Here, using recently proposed the roof method, we demonstrate the possibility for suppression of the background and selective excitation among many *coupled* molecular vibrational modes. We consider a model of two coupled harmonic oscillators representing two molecular vibrational modes and analyze the effects of relative phase between initially populated states and the conditions for selective excitation and creation of a maximum coherence. Analysis of the dressed state picture shows the relative phase conditions for the adiabatic passage leading to the desired quantum yield. The numerical results demonstrate that coupling and initial relative phase between vibrational modes play an important role in achieving maximum CARS coherence and selectivity.

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