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Background Elimination and Noise Reduction by Mechanical Modulation Raman Spectroscopy KATHLEEN HINKO, CHIEZE IBENECHÉ, ANDREA KEIDEL, TOBIAS BARTSCH, ERNST-LUDWIG FLORIN, University of Texas at Austin — Raman spectroscopy is widely used by biophysicists for the molecular identification of cellular substructures. However, there are high levels of background and noise associated with Raman spectra from other molecules in the microscopic detection volume. We present two methods of mechanical modulation for background subtraction and noise reduction in a Raman microscope: (1) a three-axis stage modulation for fixed objects and (2) a separate optical trap modulation for objects in solution. With our technique, we completely eliminate the background in our spectra and improve the signal-to-noise ratio by two orders of magnitude. We applied this technique to lipid vesicles and fission yeast cells in solution. Additionally, we obtained mechanical modulation Raman spectra of fission yeast in three dimensions and observed spatial differences in the molecular composition for different metabolic states of a single yeast cell.

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