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Detection and Monitoring of Neurotransmitters - a Spectroscopic Analysis[1] FELICIA MANCIU, University of Texas at El Paso, El Paso, TX, KENDALL LEE, Mayo Clinic, Rochester, MN, WILLIAM DURRER, University of Texas at El Paso, El Paso, TX, KEVIN BENNET, Mayo Clinic, Rochester, MN —
In this work we demonstrate the capability of confocal Raman mapping spectroscopy for simultaneously and locally detecting important compounds in neuroscience such as dopamine, serotonin, and adenosine. The Raman results show shifting of the characteristic vibrations of the compounds, observations consistent with previous spectroscopic studies. Although some vibrations are common in these neurotransmitters, Raman mapping was achieved by detecting non-overlapping characteristic spectral signatures of the compounds, as follows: for dopamine the vibration attributed to C-O stretching, for serotonin the indole ring stretching vibration, and for adenosine the adenine ring vibrations. Without damage, dyeing, or preferential sample preparation, confocal Raman mapping provided positive detection of each neurotransmitter, allowing association of the high-resolution spectra with specific micro-scale image regions. Such information is particularly important for complex, heterogeneous samples, where modification of the chemical or physical composition can influence the neurotransmission processes. We also report an estimated dopamine diffusion coefficient two orders of magnitude smaller than that calculated by the flow-injection method.

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Felicia Manciu
University of Texas at El Paso, El Paso, TX 79968

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