ABSTRACT

RAPID SCREENING AND ISOLATION OF SINGLE MOLECULES BY LASER-INDUCED FLUORESCENCE SPECTROCOPY IN MICRODROPLETS

A laser system was developed and evaluated for microdroplet fluorescence spectroscopy. The system was sensitive enough for screening and was capable of isolating a large number of single molecules. The operation principle is based on cavity-enhanced effects of spherical droplets that can increase the excitation and emission efficiency. Droplets were generated by using a glass-frit. The average droplet size was 3 μm, facilitating photon-coupling of the 514 nm Ar^+ laser beam and the 565 nm Rhodamine molecular emission. The detection limit for the system was 1.6×10^{-10} M. This detection limit provides isolation of single molecules (0, 1, 2, 3 ...) in the droplet, as determined by the Poisson Distribution. This system was also compared to a commercial fluorescence spectrometer and was superior in both sensitivity and detection limit. Development, optimization, performance, and Poisson calculations will be presented and discussed.

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