Osman Akcakir, Nicholas P Barry, Enrico Gratton, Joel Therrien, Gennadiy Belomoin, Joachim D Müller, and Munir H Nayfeh.

Characterization of fluorescent silicon nanoparticles under two photon excitation.

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Abstract

Nanocrystaline particles have shown potential for use as fluorescent probes in biological systems. Such nanoparticles are characterized by high photostability and low toxicity when compared to typical fluorescent dyes. In this work we characterize the brightness of individual silicon nanoparticles using fluctuation correlation spectroscopy. By analysis of the amplitude and time duration of the fluorescence fluctuations we conclude that their brightness (under two-photon excitation) and size are comparable to fluorescein. A suspension of silicon nanoparticles in acetone was prepared from a porous silicon substrate. We use a two-photon microscope with a femtosecond Ti-sapphire laser excitation source at 780nm. The fluorescence emission (in the photon counting regime) was detected using either an avalanche photodiode or a photomultiplier. The time sequence of the detected signal was analyzed using autocorrelation function and photon count histogram fitting software developed in our lab. This study enabled us to determine the number density of the nanoparticles, their brightness and their diffusion coefficient. We compare these parameters to a reference measurement of a similar concentration of fluorescein under the same experimental conditions. This work is supported by NIH PHS 5 P41-RRO3155.