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Measurement of two-photon absorption cross section of silicon nanocrystals in colloidal suspension[1] BRANDON FUREY, MICHAEL DOWNER, DOROTHY SILBAUGH, ADRIEN GUILLAUSSIER, University of Texas at Austin, YIXUAN YU, Lawrence Livermore National Laboratory, BRIAN KORGEL, University of Texas at Austin — Two-photon absorption (2PA) in liquid suspensions of ligand-passivated silicon nanocrystals (ncSi) is difficult to measure directly because of their low absorption cross section and competing nonlinear optical processes at high light intensity. Here we overcome these difficulties by measuring background-free, 2PA-induced photoluminescence (PL) as a function of the intensity of ultrashort 800 nm excitation pulses and then calibrating the response by measuring PL induced by one-photon absorption. Using this indirect method, 2PA cross sections of ncSi with diameters 2.2 and 2.7 nm suspended in toluene were 0.505 ± 0.005 and 2.24 ± 0.02 E-50 cm^4 s / photon, respectively. This procedure was validated using rhodamine B in ethanol for which the 2PA cross section was 21.8 ± 0.1 E-50 cm^4 s / photon, which agrees with direct measurements.[2] The size dependence of 2PA cross sections for ncSi and comparisons with other reference samples will be discussed. Water-dispersible ncSi may be suitable for bio-imaging.[3] This application is demonstrated using 2PA confocal microscopy of ncSi-incubated mouse tissue.

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[2]A. Nag, D. Goswami, J. Photochem. and Photobio. A: Chem. 206 (2-3), 188 (2009)
[3]C.M. Hessel, J. Wei, B. Korgel et al., Chem. Mater. 24 (2), 393 (2012)

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