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Measurement of absolute fluorescence quantum yield in turbid media.

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Abstract

We demonstrate the measurement of the absolute fluorescence quantum yields performed inside a multiple scattering medium. A model for frequency-domain fluorescence spectroscopy in multiple scattering media that allows the accurate recovery of fluorescence parameters such as the quantum yield has recently been verified. Our work uses this model to determine the absolute quantum yield of a fluorophore that is uniformly distributed throughout a multiple scattering medium. Using this technique, it is not necessary to have a reference fluorophore of known quantum yield. The only reference compound that is necessary is one which is used to calibrate the spectral response of the detection system. This technique does not require the calibration of the excitation and emission light paths. Because of the multiply scattering of the medium (titanium dioxide particles suspended in water), the excitation and emission geometries are identical. We present the quantum yield of Rhodamine B in water measured in both infinite and semi-infinite geometries. Supported by NIH RR03155 and CA5702, a joint Whitaker-NIH grant RR10966, and Sandia CRADA SC93/01 177.