Quantum Yield of Sensitization for IR-Sensitive Photothermographic Imaging Materials

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Abstract

One route to improving the photographic properties of photothermographic imaging materials is to better quantify the quantum yield of sensitization. An optical technique was developed to estimate the number of photo-injected electrons that are required to create a latent image for an IR-sensitive photothermographic construction. This would also give an approximate upper limit for the size of a latent image. Simply measuring the absorbance of the spectral sensitization dye is not sufficient because only a fraction of the dye is adsorbed to the silver halide grains. Furthermore, the absorbance peak of dye adsorbed to silver halide and the absorbance peak of dye not adsorbed to the silver halide in the media, are not sufficiently shifted in position to be able to separate them. This presentation will describe the development of a technique that is capable of making this distinction and will show the results obtained in quantifying the quantum yield of sensitization.

The optical technique used to estimate the number of photoinjected electrons is based on the discovery that a fraction of the infrared sensitizing dye in a photothermographic construction photobleaches very readily; the remaining fraction photobleaches at a much slower rate. The amount of dye that photobleaches readily was found to correlate very well with film speed. Therefore, the dye must be "effectively" adsorbed to the silver halide grains. "Effectively" adsorbed signifies that the dye molecule has a significant photoelectron transfer efficiency to the silver halide grain. From the photobleaching data and the sensitometric data, the number of photons absorbed by the "effectively" adsorbed dye was calculated, and the quantum yield of sensitization was estimated.