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The role of rare earth oxide nanoparticles in suppressing the photobleaching of fluorescent organic dyes ANUBHAV GUHA, Horace Greeley High School, ANINDITA BASU[1], University of Pennsylvania — Organic dyes are widely used for both industrial as well as in scientific applications such as the fluorescent tagging of materials. However the process of photobleaching can rapidly degrade dye fluorescence rendering the material non-functional. Thus exploring novel methods for preventing photobleaching can have widespread benefits. In this work we show that the addition of minute quantities of rare earth (RE) oxide nanoparticles can significantly suppress the photobleaching of dyes. The fluorescence of Rhodamine and AlexaFluor dyes was measured as a function of time with and without the addition of CeO_2 and La_2O_3 nanoparticle additives (two RE oxides that contain an oxygen vacancy based defect structure), as well as with FeO nanoparticles (which has an oxygen excess stoichiometry). We find that the rare earth oxides significantly prolonged the lifetimes of the dyes. The results allow us to develop a model based upon the presence of oxygen vacancies defects that allow the RE oxides to act as oxygen scavengers. This enables the RE oxide particles to effectively remove reactive oxygen free radicals generated in the dye solutions during the photoabsorption process.

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