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The photoacoustic effect and sonoluminescence generated by laser initiated exothermic chemical reactions in carbon suspensions HAN JUNG PARK, GERALD J. DIEBOLD, Brown University, DEPARTMENT OF CHEMISTRY, BROWN UNIVERSITY TEAM — We report generation of the photoacoustic effect through chemical reaction of particulate carbon in chemically reactive solutions. Experiments are carried out using the 10ns output of a Q-switched Nd:YAG laser to heat carbon nanoparticles, initiating chemical reaction which results in sound production. The amplitude of the photoacoustic signal from a carbon suspension in H_2O_2- H_2O mixtures is shown to increase dramatically as the percentage of H_2O_2 in solution increases. We report the power dependence of the amplitude of the photoacoustic effect, the production of continuum visible radiation, and the products of the reactions. We also report on laser induced chemical generation of sonoluminescence in aqueous carbon suspensions. Following irradiation and chemical reaction, highly compressed gas bubbles are formed. The expansion of the gas bubble past its equilibrium diameter results in oscillation of the bubble diameter. Tens of μs after the initial formation of the bubble, sonoluminescence is found to take place on collapse of the bubble. we show that laser initiated exothermic chemical reactions of particulate carbon in oxidizing solutions results in the production of an enhanced sonoluminescence relative to that found for the endothermic reactions of particulate carbon suspended in water.

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