Photothermal response of laser-prepared colloidal solutions based on substoichiometric molybdenum oxide

Anton S. Chernikov, Dmitriy A. Kochuev, Dmitrii V. Abramov, Ruslan V. Chkalov, Kirill S. Khorkov

Vladimir State University, Vladimir, Russia

Abstract

Suspensions of monolayer tungsten disulfide (WS_2) were prepared by adding WS_2 powder to test tubes with deionized water and ethanol, and then placed in an ultrasonic bath. The obtained WS_2 suspensions with concentrations of 0.2 and 1 mg/ml were subjected to femtosecond laser ablation and fragmentation. The experiments were carried out on a laser robotic complex based on the Yb:KGW femtosecond laser system (280 fs, 1030 nm, 10 kHz, 150 μJ, Avesta Ltd.).

Optical and photosensitive properties of colloidal systems were measured. We used laser radiation from a continuous diode laser source with a wavelength of 800 nm and an average laser power of 1 W. The attenuated laser beam coming out of the tube was measured using a power meter. A thermal imager from the surface of the quartz tube wall recorded thermal processes. The photosensitivity characteristics were measured during the time required to reach the maximum temperature in the zone of exposure to the laser beam. During the measurement, the time of reaching the maximum temperature was recorded, as well as the transmitted laser radiation.

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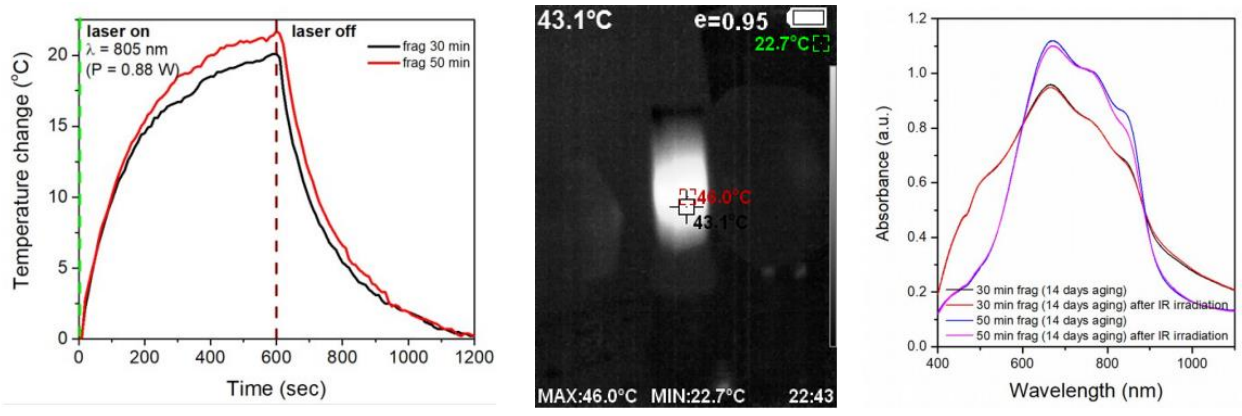

Time dependence of temperature change during irradiation of colloidal solutions by cw IR laser (805 nm, P = 0.88 W); image with thermal imaging camera; absorption spectra of colloidal solutions obtained by laser fragmentation for 30 and 50 minutes in ethanol (black and blue lines) and after IR laser irradiation for 10 minutes (805 nm) (pink and red lines).