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PMO-84

Wavelength dependence of Si nanocluster / nanocrystal phase separation in the ablation of bulk SiO targets

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The formation of Si nanocrystals by temperature-induced disproportionation of amorphous SiO is finding numerous applications in the development of new materials with enhanced electrochemical properties and size dependent photoluminescence [1, 2]. These prospects have generated a great deal of work to characterize the phase separation of nc-Si as a function of the annealing temperature [3]. In this work we have investigated the potential of laser ablation to achieve controlled generation of Si nanoclusters in SiO and characterized their size distribution and luminescence properties as a function of the laser irradiation conditions. Laser wavelengths studied were 10.6 μm, 1064, 532 and 193 nm. The development of nanoclusters in the amorphous SiO material was assessed by micro-Raman and fluorescence spectroscopy. The time distribution of the species ejected in the ablation at 1064, 532 and 193 nm was measured by time-of-flight mass spectrometry and the results were compared with the ejection velocities expected from a purely thermal ablation mechanism.

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PMO-85

In-situ ablation and analysis of subcellular components for laser ablation electrospray ionization mass spectrometry

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Water-rich targets, such as biological cells and their constituents, strongly absorb mid-infrared laser radiation at 2.94 μm wavelength. Rapid energy deposition by pulsed laser irradiation in the ambient environment initiates surface evaporation, shock-wave emission, and, at elevated fluences, phase explosion [1]. These processes result in the ejection of vapor and fine droplets originating from the sample. In laser ablation electrospray ionization (LAESI), the ablation products are intercepted by highly charged droplets, i.e., an electrospray plume, for post-ionization, and are analyzed by a mass spectrometer [2]. When an etched optical fiber is used for energy coupling,