Mathematical Problems in Engineering 2013 vol.2013

Raman spectra of nanodiamonds: New treatment procedure directed for improved raman signal marker detection

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Abstract

Detonation nanodiamonds (NDs) have shown to be promising agents in several industries, ranging from electronic to biomedical applications. These NDs are characterized by small particle size ranging from 3 to 6 nm, while having a reactive surface and a stable inert core. Nanodiamonds can exhibit novel intrinsic properties such as fluorescence, high refractive index, and unique Raman signal making them very attractive imaging agents. In this work, we used several nanodiamond preparations for Raman spectroscopic studies. We exposed these nanodiamonds to increasing temperature treatments at constant heating rates (425-575°C) aiding graphite release. We wanted to correlate changes in the nanodiamond surface and properties with Raman signal which could be used as a detection marker. These observations would hold potential utility in biomedical imaging applications. First, the procedure of optimal linear smoothing was applied successfully to eliminate the high-frequency fluctuations and to extract the smoothed Raman spectra. After that we applied the secondary Fourier transform as the fitting function based on some significant set of frequencies. The remnant noise was described in terms of the beta-distribution function. We expect this data treatment to provide better results in biomolecule tracking using nanodiamond base Raman labeling. © 2013 Raoul R. Nigmatullin et al.

http://dx.doi.org/10.1155/2013/847076