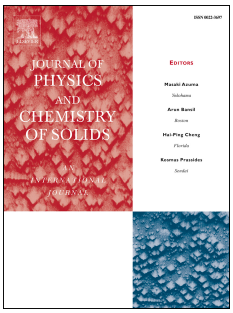
Accepted Manuscript



A comparative study on finding an effective root for the introduction of hydrogen into microplasma during diamond growth

Saman Iqbal, Muhammad Shahid Rafique, Sultan Akhtar, Nida Liaqat, Nida Iqbal, Rabia Ahmad

PII: S0022-3697(18)30087-8

DOI: 10.1016/j.jpcs.2018.06.001

Reference: PCS 8615

To appear in: *Journal of Physics and Chemistry of Solids*

Received Date: 24 January 2018

Revised Date: 28 May 2018

Accepted Date: 1 June 2018

Please cite this article as: S. Iqbal, M.S. Rafique, S. Akhtar, N. Liaqat, N. Iqbal, R. Ahmad, A comparative study on finding an effective root for the introduction of hydrogen into microplasma during diamond growth, *Journal of Physics and Chemistry of Solids* (2018), doi: 10.1016/j.jpcs.2018.06.001.

A comparative study on finding an effective root for the introduction of Hydrogen into microplasma during diamond growth

Saman Iqbal[1]*, Muhammad Shahid Rafique [1], Sultan Akhtar[2], Nida Liaqat[1], Nida Iqbal[3], Rabia Ahmad [1]

[1] Department of Physics, University of Engineering and Technology, Lahore, Pakistan

[2] Department of Biophysics, Institute for Research and Medical Consultations, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

[3] Biomedical Engineering Centre, University of Engineering and Technology, Lahore, Kala Shah Kaku (KSK) Campus, Pakistan

ABSTRACT

Nanodiamonds (NDs) have been synthesized by using microplasma facility. Ethanol is chosen as a Carbon precursor. A mixture of Ethanol and Argon has been dissociated in microplasma to fabricate NDs. In order to quench, etch and stabilize the NDs, Hydrogen has been used as a stabilizing agent. The motivation behind this project is to find an effective root for the introduction of Hydrogen into microplasma. The experiments are performed by introducing the Hydrogen either directly or indirectly into the microplasma. The results obtained from Raman, TEM and XRD confirmed that the highest quality (in terms of smallest size and near stress free) diamonds have been obtained in the case of indirect dilution. The decreased PL peak intensity with indirect dilution indicates the decreased defect density in the diamond. It is possible to produce and control the defect center only by controlling the Hydrogen introduction way in to the microplasma. The indirect dilution decreases the amount of Hydrogen bonded to trans-polyacetylene and enhances the Hydrogen termination to the surface of diamond grains.

Keywords

Nanodiamonds, Microplasma, defect center