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Thermal effusion mass spectroscopy of xenon implanted in amorphous carbon

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Structural properties of xenon incorporated amorphous carbon thin films are investigated by thermal effusion mass spectroscopy. The amorphous carbon films were prepared by sputtering a graphite target using xenon atmosphere of 5 Pa and DC bias voltage of -4.8 kV. The xenon concentration was determined by Rutherford backscattering spectroscopy. Thermal mass spectroscopy was performed in the room to 1000 ^{0}C temperature range. It was observed that the xenon atoms are released at two different temperatures. The effusion at low temperature is associated with xenon diffusion through connected voids while the effusion at high temperature is originated from xenon trapped in isolated sites. From the later process it was possible to calculate the xenon diffusion free energy (activation energy) of 1.2 eV (116 kJ/mol). Raman measurements indicate that the samples are composed of graphite agglomerates (clusters) of different diameters randomly distributed. A decrease in the clusters size was observed after the xenon effusion.

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