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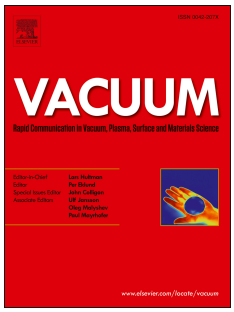

Ion bombardment of glassy carbon

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Ion bombardment of glassy carbon

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Glassy carbon has applications in the storage of high level nuclear waste. Irradiation of glassy carbon are thus of importance to investigate. The paper reviews some aspects for ion bombardment. Glassy carbon is categorised as an amorphous material with graphitic crystallites. Glassy carbon has a much lower density than graphite. Although not yet directly observed by TEM, it has been proposed that glassy carbon must contain nanopores to account for this low density. Ion bombardment causes the destruction of these nanopores leading to densification of glassy carbon. The damage caused by ion bombardment at different temperatures has been investigated mostly by Raman spectroscopy and also by TEM. High fluence implantation of heavy elements into glassy carbon leads the amorphisation of the small graphitic crystallites in the implanted region. Raman spectroscopy showed that there is only slight recovery of damage at temperatures below 1000 °C, with full recovery only at about 2000 °C. Normal (i.e. Fickian) impurity diffusion occurs at temperatures below 1000 °C. For some fission product elements implanted into glassy carbon there is a segregation towards the surface of the substrate at high (but less than 1000 °C) annealing temperatures.

Keywords: glassy carbon; ion bombardment; radiation damage; diffusion; RBS; Raman spectroscopy; TEM; densification

1. INTRODUCTION

A key feature of the modern world is the high consumption of electrical energy. Two competing factors shaping the world energy economy are the rapid industrialization of