sample with 0.3 dpa almost sustained unchanged at a temperature up to 450 ℃. After annealing at 500 ℃, a drastic reduction of hardness was observed for the samples irradiated by Ne ions to 0.1 and 0.3 dpa. The different annealing behaviors of radiation hardening at different doses under Ne ion irradiation were possibly from the evolution of bubbles growth and the interaction between interstitial clusters and Ne atoms.

5 - 32 Optical Emission from SiO_2 Irradiated by Xe^{q+} Ions*

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Swift heavy ion irradiation of solid materials is a complicated physical process that involved a large number of particle emission processes, including ultraviolet visible light emission. In order to study the ultraviolet visible light emission induced by fast heavy ions on solid, a measurement platform for swift heavy ion irradiation was built in the medium energy irradiation terminal SFC-T1 of Lanzhou Heavy Ion Accelerator. Swift heavy ion irradiation can modify the crystal structure and optical property of optical material SiO_2[1,2]. The irradiation experiment was performed with Xe^{q+} ions. During irradiation, the emission spectra, in a range of 200∼800 nm, from SiO_2 irradiated by 93∼609 MeV Xe^{q+} ions, were obtained. Two emission bands centered at 461 and 631 nm were observed[3]. These emission bands are produced by Frenkel exciton radiation recombination. Figure 1 shows that the light intensity increases with increase of the electron energy loss[3]. Ion range and recoil atom distribution, target ionization (energy loss to target electrons), damage production in SiO_2 were simulated by the SRIM code. It indicates that electron energy loss plays a leading role in the process of optical emission. In-situ measurement of the optical emission is of great significance in studying the radiation modification and can help to understand the process of crystal damage caused by ion irradiation.

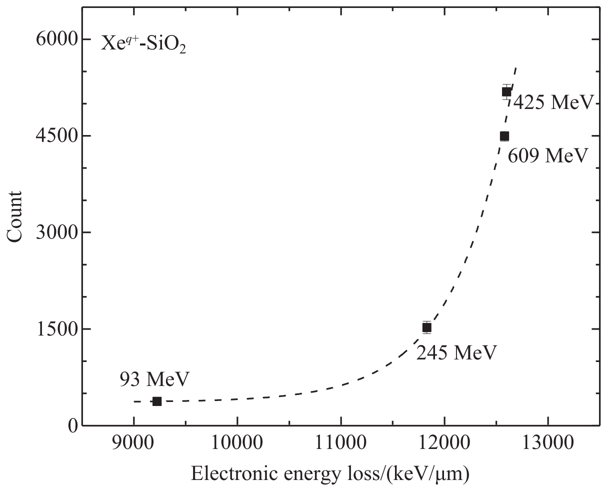

Fig. 1 (color online) The intensity of emission bands of centered at 461 nm from SiO_2 irradiated by 93∼609 MeV Xe^{q+} ions as a function of electronic energy loss.

References

[1] P. Kluth, C. S. Schnohr, O. H. Pakarinen, et al., Phys. Rev. Lett., 101(2008)175503.

[2] M. Toulemonde, W. J. Weber, G. S. Li, et al., Phys. Rev. B, 83(2011)054106.

[3] Q. M. Xu, J. Gou, C. H. Zhang , et al., Acta Physica Sinica, 72(2023)043402.

* Foundation items: National Natural Science Foundation of China (12104463, U1532262)