Defect structure in pure Ni irradiated with iodine ions and electrons

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1. Introduction

In metals, it had been considered for a long time that atomic displacement and radiation annealing (defect annihilation during irradiation) could be caused only by elastic interaction (direct collision of ions with target atoms). However, it was found that the energy transferred from electron-excitation to lattice atoms caused the radiation annealing. The resulting defect structure was expected to be influenced by this defect annihilation. However, a detailed information about the defect clustering was not available.

The purpose of our study is to clarify the effect of the radiation annealing on the resulting defect structure in pure Ni at the end of stage II (around 300 K).

2. Experimental

The irradiation with 85 MeV iodine ions (I^{7+}) was performed at 40 K. The irradiation with 2 MeV electrons was performed at 90K. Diffuse X-ray scattering (DXS) experiments were made at room temperature at the Crystal Structure Analysis beamline BL02B1 with a wavelength of 1.51 Å.

3. Results and discussion

We have investigated the defect structure in pure Ni irradiated with 150 MeV phosphorus ions[1]. It was shown that the increase of the number density of interstitials in interstitial loops was negligibly small, indicating that the presence of the radiation annealing. For iodine irradiation, the cross section of the radiation annealing became to be evaluated from the detailed comparison with the previous data of the electrical resistivity. The collection and comparison of the present DXS data will enable us to investigate the kinetics of the defect formation under high-energy ion-irradiation. The analysis was in progress.

References

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