

Modulated structure and local oxygen reordering induced by high-energy Au ion irradiation in $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$

Yan Y, Doyle RA, Campbell AM, Wirth G, Stobbs WM
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We have investigated the damage induced in single crystals of the high- T_c superconductor $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ by high-energy (2.25 GeV) Au-ion irradiation. Transmission electron microscopy characterization reveals that irradiation in the **c**-axis direction leads to the formation of aligned columnar defects, the diameter of which is modulated along the **c** axis. The columns are amorphous and the associated volume expansion causes strain in the surrounding matrix. Lobed 'bow-tie' contrast is observed in the [001] high-resolution images of the regions surrounding the amorphous columns. It is shown that this contrast is caused by local O reordering in the **a–b** planes to give a 90° reorientation of the orthorhombic unit cell in the affected area, this allowing partial relaxation of the tensile hoop stress around the amorphous columns.