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Crystalline hillock formation of oxides irradiated with swift heavy ions -TEM study-

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In this study, CeO₂ and NiO were irradiated with Au ions in the energy range of 200-340 MeV at oblique incidence. Observation of as-irradiated samples by transmission electron microscope (TEM) shows that hillocks are created not only at the wide faces but also at the crack faces of thin samples. Since the hillocks created at the crack faces can be imaged by TEM, their shape and crystallographic features can be revealed by TEM. From the images of hillocks created at the crack faces, many of the hillocks are found to be spherical for ion-irradiated CeO₂. For ion-irradiated NiO, atomic-scale steps are found to be created at the top surface of the hillocks. We present an experimental evidence that hillocks created for both oxides irradiated with swift heavy ions have a crystal structure whose lattice spacing and orientation coincide with those of the matrix. The mechanism of hillocks formation will be discussed based on the present results, and the advantages of the novel observation technique used in the present study will be also discussed.

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