Electric charges as an apparent governing parameter for electron induced stress relaxation in amorphous silica micropillars

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Abstract

We report a new approach on the phenomenon of plastic flow induced by electron irradiation in amorphous silica, revealing that the total injected electric charge is the governing parameter of the mechanical response: micropillar relaxation tests conducted under electron irradiation showed a one-to-one relationship between the injected electric charge and the measured mechanical stress level, regardless of the applied current. Moreover, by performing these tests at high temperature, we have found that the effects of electronic processes and temperature are decoupled. This result suggests that under the present irradiation/temperature conditions, the density of flow defects is controlled only by irradiation, while the plastic rearrangement of the defects depends only on temperature.

Keywords: Amorphous silica, Electron beam irradiation, Electric charge, Micropillar relaxation, High, temperature micromechanical tests.

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