

## MRS Communications

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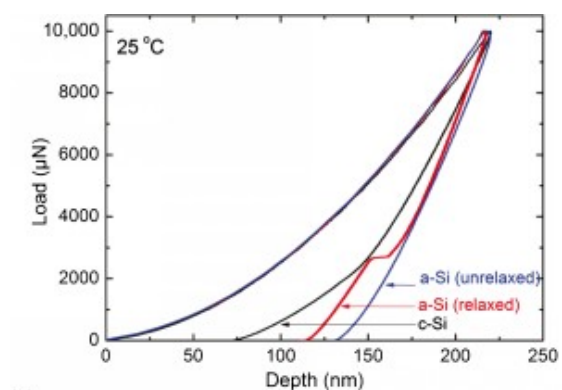
### Rapid Communications

#### Phase stability of silicon during indentation at elevated temperature: evidence for a direct transformation from metallic Si-II to diamond cubic Si-I

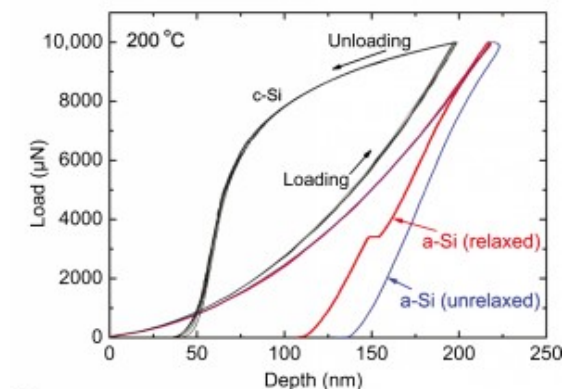
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(a)



(b)

### Abstract

Nanoindentation-induced phase transformations in both crystalline silicon (c-Si) (100) and ion-implanted amorphous silicon have been studied at temperatures up to 200 °C. The region under the indenter undergoes rapid volume expansion at temperatures above 125 °C during unloading, which is indicated by “bowing” behavior in the load–displacement curve. Polycrystalline Si-I is the predominant end phase for indentation in crystalline silicon whereas high-pressure Si-III/Si-XII phases are the result of indentation in amorphous silicon. We suggest that the Si-II phase is unstable in a c-Si matrix at elevated temperatures and can directly transform to Si-I during the early stages of unloading.

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