Response to “Comment on ‘Phase transformations induced in relaxed amorphous silicon by indentation at room temperature’ ” [Appl. Phys. Lett.87, 016102 (2005)]

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Citation: [Applied Physics Letters](#) **87**, 016103 (2005); doi: 10.1063/1.1992664

View online: <http://dx.doi.org/10.1063/1.1992664>

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Response to “Comment on ‘Phase transformations induced in relaxed amorphous silicon by indentation at room temperature’ ” [Appl. Phys. Lett. 87, 016102 (2005)]

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(Received 19 April 2005; accepted 9 June 2005; published online 1 July 2005)

[DOI: 10.1063/1.1992664]

In a recent letter¹ we reported experimental results of a study on deformation processes in different states of amorphous silicon (*a*-Si). A comment on this letter by Chaudhri *et al.*² does not challenge the scientific findings of that study in any way. Indeed, it is somewhat perplexing that Chaudhri *et al.* do not address the central point of our letter, which was the observation of clear differences in the mechanisms of deformation observed in different states of amorphous silicon (*a*-Si). Instead the Comment² states that our letter did not refer to an additional relevant three publications^{3–5} in this area, which we will now address in turn.

Both Refs. 3 and 4 report phase transformations in *a*-Si but make no reference to the state of the *a*-Si samples, which is the central focus of our letter.¹ Hence, these publications are certainly relevant and we should have referred to them; however, they are not a critical omission and do not change the interpretation or conclusions presented in our letter in any way.

We do not feel that it is appropriate to cite Ref. 5, as this study is of little direct relevance to our letter for a number of reasons: (1) Our study is only considering *a*-Si and does not

discuss similar processes in Ge. (2) Thin films are known to deform very differently to bulk materials. (3) Deposited amorphous materials always contains a high concentration of hydrogen, which again dramatically alters the nature of the deformation mechanisms.

Finally, we would like to address the last paragraph of the Comment concerning the degree of crystallization during annealing of *a*-Si at 450 °C. In our letter we stated that this temperature is “not sufficient to induce any significant crystallization.” We strongly defend this comment as it has been extremely well established⁶ for some years now that the epitaxial growth of *c*-Si from the amorphous phase is negligible at temperatures at and below 450 °C.

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