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# Influence of annealing atmosphere on crystallization of amorphous $\text{Si}_{1-x}\text{Ge}_x$ thin film by Raman spectroscopy

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## ABSTRACT

The influence of annealing atmosphere on the crystallization behavior of amorphous structure in  $\text{a-Si}_{1-x}\text{Ge}_x$  thin films was studied with Raman spectroscopy. We annealed  $\text{a-Si}_{1-x}\text{Ge}_x$  ( $x = 0, 0.14, 0.27$ ) thin films at 800 °C under various atmosphere and observed change in Raman spectra. We confirmed that nitrogen-annealing atmosphere promotes crystallization of the  $\text{a-Si}$  film, however, the crystallization was not promoted in the annealing under Ar atmosphere and in vacuum.

In the case of  $\text{a-Si}$  thin films containing Ge atoms, the crystallization in the  $\text{a-Si}_{1-x}\text{Ge}_x$  ( $x < 0.25$ ) film was not promoted, although  $\text{a-Si}_{1-x}\text{Ge}_x$  ( $x \geq 0.25$ ) film was crystallized when the annealing in a  $\text{N}_2$  atmosphere. However, crystallization of the  $\text{a-Si}_{1-x}\text{Ge}_x$  ( $x = 0, 0.14, 0.27$ ) were not promoted by the annealing under Ar atmosphere or in vacuum. The distortion induced by the presence of Ge atoms in the random-network of  $\text{Si}_{1-x}\text{Ge}_x$ , at a content below 25%, stabilizes the amorphous structure and obstructs the crystallization even in the annealing under the  $\text{N}_2$  atmosphere.

Keywords : amorphous structure; crystallization; Raman spectroscopy; silicon

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