

## Correlation between the optical and electrical behaviour of Si/Ge multilayers and SiGe layers

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The electrical [1] and optical transmission behaviour of amorphous Si/Ge multilayers (100 periods of pairs of Si and Ge layers, with constituent layer thicknesses of 1.5-1.5 nm) and amorphous SiGe layers prepared on p-type Si substrates by magnetron sputtering, have been studied. Depending on the sputtering circumstances different microstructure of the deposited layers was obtained. Polycrystalline SiGe layers obtained by annealing the sputtered layers, were also studied. The electrical behaviour were studied using evaporated Al Schottky junctions.

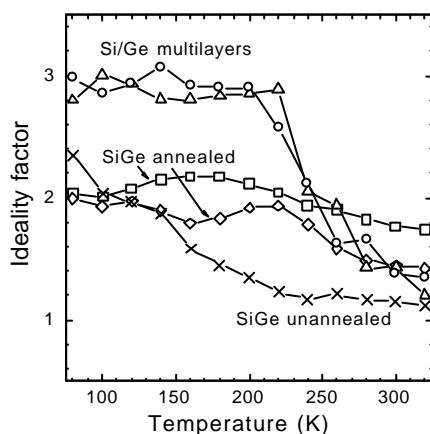


Fig. 1.

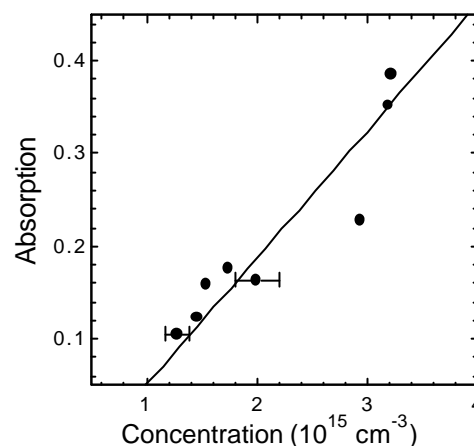


Fig. 2.

It has been found that the microstructure and composition of the layers had a significant influence on the observed optical and electrical [1] properties. The I-V characteristics and their temperature dependence were significantly different for the Si/Ge multilayers, the amorphous SiGe layers and the annealed polycrystalline SiGe layers, as it can be seen in Fig. 1 presenting the ideality factors for the most abrupt parts of the I-V characteristics [1] as a function of temperature. However, a very good correlation has been obtained between the electrical behaviour and the optical absorption, as it can be seen in Fig. 2 that presents the absorption of the Si/Ge multilayers and SiGe layers at a photon energy of 1.025 eV as a function of the apparent free hole concentration evaluated from the room temperature capacitance-voltage measurements for the studied wafers.

*Acknowledgement.* This work has been supported by the (Hungarian) National Research Fund (OTKA) under Grant No. 030421.

Reference:

[1] Zs. J. Horváth, K. Järrendahl, M. Ádám, I. Szabó, Vo Van Tuyen, Zs. Czigány, Appl. Surf. Sci., **190**, 403, 2002.