Abstract Submitted
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Indentation-induced structural phase transformations of semiconductor materials and applications[1] MAHA KHAYYAT, KACST assignee, NORMA SOSA, IBM assignee, M. MUNAWAR CHAUDHRI, University of Cambridge, CAVENDISH LABORATORY, UNIVERSITY OF CAMBRIDGE TEAM, T. J. WATSON RESEARCH CENTER, IBM COLLABORATION — During hardness indentation materials are subjected to highly localized pressures. These pressures may cause a complete change of the crystal structure of the material within the indented zone. Such structural phase transformations were observed within Vickers indentations made at room temperature in single crystals and amorphous films of Si and Ge. However, when indentations were made at 77 K in Si and Ge, no phase transitions were observed in either. Measurements were also taken from indentations made in silicon single crystals at different temperatures namely 263, 243, 235 and 206 K, and they showed a strong correlation of phase transformation with temperature. It was suggested that during room temperature indentations there is a significant temperature rise approximately to 760 K, which may assist phase transformation. Raman spectroscopy was used as an *ex-situ* tool monitoring phase transformations in semiconductor materials. *In-situ* electrical characterizations of indentation-induced metallization in single crystals of silicon were performed using two- and four-contact measurements. The previous work has led to a technique relates to semiconductor device manufacturing, including solar cells, which is a method for controlling the removal of a surface layer from a base substrate utilizing low-temperature.

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