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ion irradiation induced porosity in Ge/SiGe alloys

Over the past two decades, nanoporous semiconductors such as Si, Ge and SixGe1-x alloys have attracted remarkable interest in both fundamental research and industrial applications. Such materials can be used as filters[1], sensors[2], and as anodes for electric batteries[3]. Much research has focused on studying porosity in Ge, dating back to 1982[4], where it was reported that irradiation-induced macroscopic swelling occurred in amorphous materials. A porous structure can be formed by using several ions species. A low fluence of 1015 ion/cm2 can drastically change the surface morphology. Naoporous structure is also sensitive to the temperature as reported by Stritzker[6] where a porous structure in Ge can be formed between -80°C to 200°C. Out of this range, there is no pore formation. However,. The only study which investigated porosity in Si1-xGex alloys is by Romano et al[8] they found a porous structure at 90% of Ge, no porosity at lower Ge content. On the other hand this current research has observed a porous structure in Si1-xGex alloys for x 0.77 irradiation at room temperature. In the current work, we characterize the pore formation with respect to the implantation temperature and the alloy compositions. Multi characterization techniques have used including electron microscopy (TEM, and SEM), and optical profilometry.

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Primary author: Mrs ALKHALDI, Huda (ANU)

Co-authors: Dr KREMER, Felipe (Centre for Advanced Microscopy, The Australian National University); Prof. WILLIAMS, James (Department of Electronic Materials Engineering, the Australian National University); Prof. RIDGWAY, Mark (Department of Electronic Materials Engineering, the Australian National University)

Presenter: Mrs ALKHALDI, Huda (ANU)