

ABSTRACT:

In this work we prepared germanium nanostructures by means of filling the material inside porous silicon (PS) using conventional and cost effective technique, thermal evaporator. The PS acts as patterned substrate. It was prepared by anodization of silicon wafer in ethanoic hydrofluoric acid (HF). A Ge layer was then deposited onto the PS by thermal evaporation. This was followed by deposition of Si layer by thermal evaporation and anneal at 650°C for 30 min. The process was completed by Ni metal deposition using thermal evaporator followed by metal annealing of 400°C for 10 min to form metal semiconductor metal (MSM) photodetector. Structural analysis of the samples was performed using energy dispersive x-ray analysis (EDX), scanning electron microscope (SEM), X-ray diffraction (XRD) and Raman spectroscopy (RS). EDX spectrum suggests the presence of Ge inside the pores structure. Raman spectrum showed that good crystalline structure of Ge can be produced inside silicon pores with a phase with the diamond structure by (111), (220) and (400) reflections. Finally current-voltage (I- V) measurement of the MSM photodetector was carried out and showed lower dark currents compared to that of Si control device. Interestingly the device showed enhanced current gain compared to Si device which can be associated with the presence of Ge nanostructures in the porous silicon.