

Photo-electrochemically synthesized light emitting nanoporous silicon based UV photodetector: influence of current density

ABSTRACT

Nanoporous silicon (n-PSi) with diverse morphologies was prepared on silicon (Si) substrate via photo-electrochemical etching technique. The role of changing current density (15, 30 and 45 mA cm⁻²) on the structure, morphology and optical properties was determined. As-prepared samples were systematically characterized using XRD, FESEM, AFM and photoluminescence measurements. Furthermore, the achieved n-PSi sample was used to make metal–semiconductor–metal (MSM) UV photodetector. The performance of these photodetectors was evaluated upon exposing to visible light of wavelength 530 nm (power density 1.55 mW cm⁻²), which exhibited very high sensitivity of 150.26 with a low dark current. The achieved internal photoconductive gain was 2.50, the photoresponse peak was 1.23 A W⁻¹ and the response time was 0.49 s and the recovery time was 0.47 s. Excellent attributes of the fabricated photodetectors suggest that the present approach may provide a cost effective and simple way to obtain n-PSi suitable for sundry applications.

Keyword: N-PSi; Photo-electrochemical etching; Photodetector; Photoresponse; Current density