Study of Photo-Electrical Characteristics with Porous Silicon/n-Si Structure

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ABSTRACT

Now days several microelectronic and optical devices have been developed, such as porous silicon(PS) photodetector, Ps light emitting diodes, PS solar cells. A porous silicon(PS)/n-Si structure has been prepared by using electrochemical anodization method, in which the porous silicon is acted as an antireflection layer. The electrochemical anodization method exhibits many advantages of low-cost, high-economic efficiency, and compatible with Si technology. In PS photodetectors, the largest disadvantage is the relative large leakage current because during the etching PS by HF, many dangling bonds existed on the surface of PS as a result of trap centers, leading to large leakage current of PS photodetectors. Thus how to decrease the trap centers of PS, reducing leakage current has become a key issue. In this study, the TiO2, grown on the surface of PS by using liquid-phase deposition method, is used to compensate the trap centers and reduce leakage current, increasing the stability of PS. In this study, the TiO2, grown on the surface of metal/PS/metal structure by using liquid-phase deposition method, is used to reduce 60.5 leakage current. The ratio of photo-to-dark-current ratio is 513, and a photoresponsivity of 1.52 A/W.

Keywords : porous silicon ; electrochemical anodization method ; liquid phase deposition ; titanium dioxide ; silicon dioxide

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