World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:8, No:07, 2014

Fabrication and Properties of Al2O3/Si Quantum Well-Structured Silicon Solar Cells

Authors : Kwang-Ho Kim, Kwan-Hong Min, Pyungwoo Jang, Chisup Jung, Kyu Seomoon

Abstract : By restricting the dimensions of silicon to less than Bohr radius of bulk crystalline silicon (~5 nm), quantum confinement causes its effective bandgap to increase. Therefore, silicon quantum wells (QWs) using these quantum phenomena could be a good candidate to achieve high performance silicon solar cells. The Al2O3/Si QW structures were fabricated by using the successive deposition technique, as a quantum confinement device to increase the effective energy bandgap and passivation effect in Si surface for the 3rd generation solar cell applications. In Si/Al2O3 QWs, the thicknesses of Si layers and Al2O3 layers were varied between 1 to 5 nm, respectively. The roughness of deposited Si on Al2O3 was less than 4 Å in the thickness of 2 nm. By using the Al2O3/Si QW structures on Si surfaces, the lifetime measured by u-PCD technique increased as a result of passivated surface effects. The discussion about the other properties such as electrical and optical properties of the QWs structures as well as the fabricated solar cells will be presented in this paper.

Keywords : Al2O3/Si quantum well, quantum confinement, solar cells, third generation, successive deposition technique
Conference Title : ICMSCMP 2014 : International Conference on Material Science and Condensed Matter Physics
Conference Location : Zurich, Switzerland
Conference Dates : July 30-31, 2014