

Nanostructured surfaces

Standard Si photovoltaic devices with ZnO film obtained by pulsed laser deposition

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In recent years using of photovoltaic cells had increased, which is connected with growing energy demand and with exploitation of conventional sources of energy. Photovoltaic cell industry is now dominated by silicon technology due to its stability (average lifetime of silicon cells is estimated for 20 years), low emergency, ease of production and no need for maintenance. The theoretical maximum of efficiency for these cells is 29%, commonly used are cells with efficiency 15-17%. One of the methods for increasing efficiency is depositing of antireflection layer. In this work the zinc oxide thin layer deposited on standard silicon PV cells was used. The improvement of the efficiency of silicon cell as a result of deposition zinc oxide by Pulsed Laser Deposition method (PLD) was proven. Zinc oxide films was deposited in different temperatures of silicon substrates using second harmonic of YAG-Nd³⁺laser.

Photovoltaics properties of PV structures were determined by current voltage characteristics analysis. The structural properties of zinc oxide films were analyzed by SEM technique. Analyzing the structure of obtained ZnO layer, it is observed that depending to the substrate temperature film can condense in planar or columnar mode. For structures with planar type of growth the PV output efficiency decreased of 33%, while in the case of columnar type of growth the output efficiency increased of 17% in comparison to 12% input efficiency of PV base cell.