

Thermoelectric power-factor of Ag-doped TiO₂ thin film

ABSTRACT

The thermoelectric power-factor of two types of rutile-phased nanostructured-TiO₂ thin films doped with Ag was investigated at room temperature, by measuring their Seebeck coefficient and electrical conductivity. The thin films, consisting of a nanorod structure (single layer) and nanorod and nanoflower structure (bilayer) of TiO₂, with the addition of different wt.% of AgNO₃ were synthesized on an F:SnO₂ -coated glass substrate. The evaluated thermoelectric power-factor was observed to increase with an increasing wt.% of AgNO₃ for both structures, with the bilayer structure increasing three times more than the undoped bilayer-structure, with a value of 148 $\mu\text{Wm}^{-1}\text{K}^{-2}$ at 0.15 wt.%. This enhancement was due to the increase in electrical conductivity, which compensated for the small changes in the Seebeck coefficient, which were likely due to the increase in carrier concentration. Consequently, an enhancement in the thermoelectric conversion-efficiency of TiO₂ thin film may be observed by Ag doping, without influencing the layer structure and material phase.