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Giant Seebeck coefficient in the microwave synthesized β -Co(OH)₂ nanoplatelets for thermoelectric power generators

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Renewable energy is quite important for the future energy demands. It also can overcome the global warming and CO₂ emissions created by fossil fuels combustion. Sunlight heat and other sources of heat are considered as a good sources for renewable energy. Thermoelectric materials (TE) are promising as energy generators, by means converting heat into electrical energy. In this work cobalt hydroxide (β -Co(OH)₂) nanoplatelets were synthesized by the microwave chemical assisted route and studied for their thermoelectric properties. Uniform nanoplatelets were produced with a thickness and diameter around 8 and 100 nm, respectively. The TE measurements revealed a giant positive value for Seebeck coefficient, which is around 50,000 μ V/K. This positive value indicating a p-type semiconductor. It was observed to slightly increase by increasing the temperature from room temperature to 400 K. The electrical conductivity of this nanostructure has a semiconductor behavior with a moderate value, which has been observed to increase from 0.4 to around 3 S/m by increasing the temperature in the above-mentioned range. The power factor value was calculated and found to strongly depend on the temperature. It drastically increased from 500 to 9000 μ W/m.K² by increasing the temperature from room temperature to 400 K. These preliminary results are quite promising for future TE materials and might be suitable for thermoelectric power generators.

Biography

Ahmed Salem Alshahrie is the director of the Nanotechnology center and head of the Physics department at King Abdulaziz University. He has BSc, in Physics in 2001, King Abdulaziz University; MPhil in Physics, 2007 University of Wales Swansea, Swansea UK. PhD, in Physics, Swansea University, Swansea UK. Teaching different courses in the Physics Department. He spent a good time at a well recognized research center. His research work is mainly focused on Photonic Nanomaterials, Raman Spectroscopy, nanostructure, Synthesis, Characterization applications. He has a good number of articles published in revered international journals.

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