PHYSICAL CHEMISTRY 2016

2nd International Meeting
on

Materials Science for Energy Related Applications

BOOK OF ABSTRACTS

September 29-30, 2016
University of Belgrade - Faculty of Physical Chemistry, Belgrade

KTH
ROYAL INSTITUTE OF TECHNOLOGY
Stockholm, Sweden

UNIVERSITY OF BELGRADE
FACULTY OF PHYSICAL CHEMISTRY
Belgrade, Serbia

THE SOCIETY OF
PHYSICAL CHEMISTS OF SERBIA
Belgrade, Serbia

2nd International Meeting

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Materials Science for Energy Related Applications

held on September 29-30, 2016 at the University of Belgrade, Faculty of Physical Chemistry, Belgrade, Serbia

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THERMOELECTRIC PROPERTIES OF $NaCo_{2-x}Cu_xO_4$ (x = 0, 0.01, 0.03, 0.05) CERAMIC

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Layered cobalt oxides have attracted great attention during past decade as potential candidates for thermoelectric application. However, the scientists are dealing with several problems concerning synthesis, Na evaporation, changes of the stoichiometry of the ceramic, etc. In order to reduce synthesis duration and temperature, prevent Na evaporation and improve mixing of the precursors we applied mechanochemically assisted solid state reaction and citric acid complex methods to obtain $NaCo_{2-x}Cu_xO_4$ (x = 0, 0.01, 0.03, 0.05) powders. Ceramic samples were prepared by pressing into disc-shaped pellets and subsequently sintered at 880 °C in inert argon atmosphere. The electrical resistivity (ρ), the thermal conductivity (κ) and the Seebeck coefficient (S) were measured simultaneously in the temperature range from 2 K to 830 K, and the effect of small concentrations of the dopant on the thermoelectric properties was observed. It was found that in the low temperature range ρ increased with temperature, indicating metallic behavior. The values of κ decreased as the temperature increased. S was higher in all Cu-doped samples, reaching 145 μV/K at 830 K for x = 0.03, and this suggested strong electron correlation in these systems. The highest figure of merit (ZT) at room temperature (0.022) was obtained for x = 0.01 prepared by the citric acid complex method and it was twice higher than in undoped sample. In the temperature region between 300 K and 830 K, higher ZT was also obtained for the samples prepared by citric acid complex method, reaching the value of 0.056 at 830 K for x = 0.05 and it was almost three times higher than in undoped sample. These results confirm that even small concentration of Cu significantly influences the thermoelectric properties of $NaCo_2O_4$.