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The Effect of Graphene Oxide Addition in Copper Selenide Compound on Thermoelectric Efficiency

In this project, copper selenide compounds (Cu_2Se) were synthesized and used as p-type thermoelectric materials. Graphene oxide (GO) at 0.1, 0.5 and 1 wt% concentrations was added in the Cu_2Se compounds. Cu_2Se was synthesized by a ball mill method, adding GO at various concentrations by crushing and mixing, followed by shaking. It was then hot-pressed to obtain high density bulk pellets. The sample examined by X-ray diffraction (XRD), showed the Cu_2Se phase with a cubic structure, but after hot-pressing, an additional monoclinical Cu_2Se phase was formed, due to the phase change at temperatures above 400 K. The analysis from the FE-SEM technique showed that the grain size decreased with increasing GO concentrations, corresponding to the carbon content in EDS, which showed the increased carbon content. From thermoelectric properties measurement, it was found that the Seebeck coefficient was positive and tended to increase slightly with GO concentration. Thermal conductivity was decreased with adding GO. The $\text{Cu}_2\text{Se}+\text{GO}$ showed the increased the ZT up to 0.8 at 500 °C, at the concentration of 1 wt% GO. However, the ZT was not enhanced significantly compared to the Cu_2Se without GO.

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