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***P41. Microstructure and thermoelectric properties of misfit-layered cobalt oxides with metallic nano-inclusions prepared by a printing technique***

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In order to broaden the use of thermoelectric (TE) materials for practical application as an electric power generator from waste heat, simple, cheap and reliable methods for producing materials and thereof TE elements must be considered and demonstrated. We have employed a printing technique, which is cheap and easy to carry out, to prepare p-type TE-tapes (TE materials on a ceramic substrate) using nano-scale misfit-layered cobalt  $\text{Ca}_3\text{Co}_4\text{O}_9$  oxide materials with metallic nano-inclusions. The TE-tapes were sintered in air at various temperatures and holding time. After each sintering process, microstructure observation by a scanning electron microscopy (SEM) and crystal structure through the X-ray diffraction analysis were carried out in order to find an optimal sintering condition. The thermoelectric properties were characterized from room temperature up to about 1000 K. We found that the maximum power factor was improved about 67% ( $3.10 \times 10^{-4} \text{ Wm}^{-1}\text{K}^{-2}$ ) for the tape with a proper of silver (Ag) metal nano-inclusions as compared to ( $1.86 \times 10^{-4} \text{ Wm}^{-1}\text{K}^{-2}$ ) for the counterpart without metallic nano-inclusions under the same sintering condition at 950 °C. The thermoelectric properties and thermal stability of TE-tape is further improved by a subsequent hot-pressed sintering process.