

## Synthesis and characterization of the combinatorial films of the thermoelectric system, Ca-Co-O

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Thermoelectric oxides have attracted considerable attention in recent years as potential waste heat conversion candidate materials not only because of their promising thermoelectric properties, but also because of the stability of oxides at high temperature. Two specific compounds in the Ca-Co-O family, namely, the low-dimension cobaltates  $\text{Ca}_2\text{Co}_3\text{O}_6$  and  $\text{Ca}_3\text{Co}_4\text{O}_9$ , showed promising thermoelectric properties. The combinatorial film technique is a high throughput method to study phases and phase relationships in a binary or multicomponent system. This technique has an advantage when compared to conventional film deposition techniques since the composition varies continuously with position. Films were deposited from CaO and CoO targets using the combinatorial pulsed laser deposition (PLD) with varying temperature, substrate and oxygen partial pressure. X-ray diffraction (XRD) was used to identify the phases present. For example, when the film was prepared at 550 °C, we observed  $\text{CaCo}_2\text{O}_4$  which is a high pressure phase (does not occur under ambient conditions) that has an orthorhombic structure. This paper discusses our preparation, characterization, and thermoelectric property measurements of combinatorial films prepared in the Ca-Co-O system using the PLD.

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