Spatially Resolved Seebeck Coefficient Measurements

Scientific Achievement

An instrument for spatially resolved Seebeck coefficient measurements has been developed and applied to test Zn-Co-O and Ni-Co-O combinatorial sample libraries.

Significance and Impact

The instrument can quickly determine the type and estimate the density of the majority carriers in new materials (holes/electrons) and can do high-throughput screening of optoelectronic and thermoelectric materials.

Research Details

Design Feature: Steady-state temperature gradient coupled to scanning probe voltage measurements (Fig. 1).

Benefit: Temperature-dependent Seebeck coefficient measurements up to 400 °C.

Materials Result: Co-M-O (M=Zn, Ni) are *p*-type electric conductors across a wide compositional range (Fig. 2).

Technology Application: Enabled materials use as *p*-type contacts in OPV with CIS:SEM EFRC [*MRS Comm.* **1**, 23 (2011); *Adv. En. Mat.* **3**, 524 (2013)].

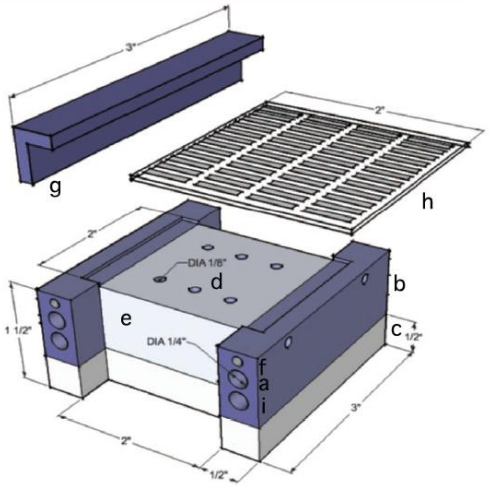

Fig. 1: Schematic of Seebeck coefficient mapping instrument

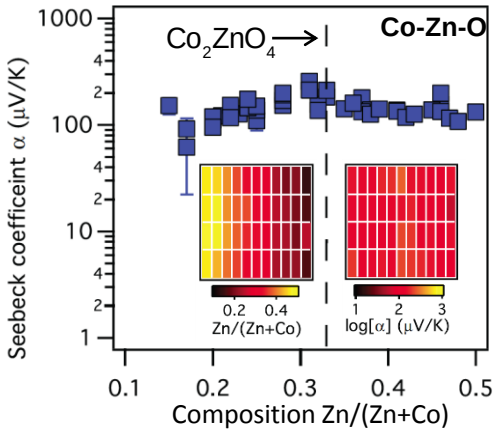

Fig. 2: Seebeck coefficient of Zn-Co-O. Inset: Mapping data used in main graph

A. Zakutayev et al., *Rev. Sci. Instrum.* **84**, 053905 (2013).