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Publication date:
2013

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Citation (APA):

Le, T. H., Pham, H. N., Han, L., Holgate, T., Van Nong, N., Linderoth, S., & Pryds, N. (2013). Fabrication and performance of high temperature segmented thermoelectric oxide-based module. Abstract from 32nd International Conference on Thermoelectrics, Kobe, Japan.

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Fabrication and performance of high temperature segmented thermoelectric oxide-based module

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In order to improve the power generation performance of oxide modules, segmented p-legs of half-Heusler (HH) alloy $Zr_{0.5}Hf_{0.5}CoSb_{0.8}Sn_{0.2}$ to layered-colbatite $Ca_3Co_4O_9$ and n-legs doped-ZnO were used. The thermoelectric properties of both single and segmented legs were characterized from 300 to 1100 K. Using these data as input parameters, segmented module was first theoretically designed by 1D numerical modeling, in which the compatibility factor of HH alloy and oxides were taken into consideration to maximize the efficiency of their segmentation. Based on the modeling strategy design, segmented modules were constructed, tested, and its performance is compared with theoretical result and with non-segmented oxide modules.