

Development of High Efficiency Segmented Thermoelectric Unicouples

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Abstract Highly efficient, segmented thermoelectric uncouple incorporating advanced thermoelectric materials with superior thermoelectric figures of merit are currently being developed at the Jet Propulsion Laboratory (JPL). These segmented uncouples include a combination of state-of-the-art thermoelectric materials based on Bi_2Te_3 and novel p-type Zn_4Sb_3 , p-type $\text{CeFe}_4\text{Sb}_{12}$ -based alloys and n-type CoSb_3 -based alloys developed at JPL. The maximum predicted thermal to electrical efficiency is about 15% for a hot-side temperature of 975K and a cold-side temperature of about 300K. Various segmentations have been explored and several uncouples have been fabricated and tested. The set-up for testing these uncouples is described in this paper and the tests results reported. I-V curves have been generated for selected uncouples. The results show that experimental thermal to electrical efficiency values close to theoretical predicted values have been measured. Several potential applications for these advanced uncouples are reviewed.

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