



## Invited speaker's information form of IUMRS-ICA2017

### Presentation on Symposium of “**smart materials (D7)**”



**Presentation title:**

Variations in the thermoelectric device geometry for low  $\$/W$  and wearable system

**Speaker's name and affiliation:**

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**Brief biography of Speaker:**

Prof. Woochul Kim received his Ph.D. at U. C. Berkeley in 2005. Then, after one and a half year as a postdoctoral researcher, he has been in Yonsei University as an assistant, associate, and full professor since 2007. He was a consulting professor at LG Innotek and a principal investigator for the ‘National Leading Research Laboratory’ supported by the Korean government. He is the recipient of the Young Thermal Engineer Award by KSME (Korean Society of Mechanical Engineers) in 2013, KSTP award in 2013 (Korean Society of Thermophysical Properties), and Netzsch KSTP TPP award in 2015.

**Abstract:**

We propose a way to lower the  $\$/W$  value, while maintaining a decent power output of a thermoelectric device by changing the device architecture. We demonstrated that the  $\$/W$  value can be reduced to around 40% while maintaining ~65–70% of the maximum possible power output with a given  $zT$ . A clear experimental demonstration is shown as well. Rough calculation suggests  $zT \sim 6$  is required to achieve this low  $\$/W$ . The device architecture we proposed should be useful to recover low quality waste heat, which is abundant and could be harvested as long as the  $\$/W$  value is low enough in general. Also, we present two types of wearable thermoelectric devices based on bulk inorganic materials; one is bracelet type and the other is mat style. Utilizing high performance that can be extracted from the bulk inorganic materials, the devices based on the materials are bendable and flexible. Performance of the device attached on a human body is compared with theoretical analysis based on a human thermoregulatory model.

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