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11:00
CTN Auditorium

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BACKGROUND

Takao Mori received his PhD in 1996 at Univ. Tokyo, Dept. Physics. He is a Field Director at the National Institute for Materials Science (NIMS) in Japan. Professor of the Univ. Tsukuba Graduate School and elected Board Member of the International Thermoelectric Society (ITS) and ITS President from July 2023. He is a Senior Editor of Materials Today Physics, and Program Manager of JST Mirai Large-scale Program a 10 year project, and is a Chair of the 2024 MRS Spring Meeting. He has published over 350 papers, 25 book chapters, and 35 patents. Research interests include development of thermoelectric materials and enhancement principles, magnetism, synthesis and properties of borides, inorganic materials.

Also at:
https://videoconf-colibri.zoom.us/j/82726221024?pwd=QmE3elhQelJGeU91d1dheXhkdlMvZz09

Utilizing novel enhancement principles to develop high performance thermoelectrics

Abstract

Development of thermoelectric (TE) materials is important, for energy saving via waste heat power generation [1], and IoT power sources [2]. For high TE performance, tradeoffs must be overcome, between Seebeck coefficient S and electrical conductivity σ, and between electrical and thermal conductivity κ [3]. For the latter, in addition to nanostructurings, intrinsic low κ mechanisms: Materials informatics approach [4], doping leading to lattice softening [5], heterogeneous bonding from mixed anions [6], etc. For the first tradeoff, magnetism can be utilized to enhance S via magnon drag in $CuFeS_2$ [7] and metastable Fe_2VAl-based thin films [8,9], paramagnon drag in $CuGaTe_2$ [10], Bi_2Te_3 [11] etc., Spin fluctuation [12], Spin entropy [13]. Recently, striking Cu doping effect in Mg_3Sb_2: interstitial Cu doping lowered the phonon group velocity, while doping into the grain boundaries led to very high mobilities similar to single crystals, while being low κ polycrystalline. An initial realistic 8-pair module exhibited efficiency of 7.3%@320ºC, while estimated material efficiency ~11%! [14]. Tuning toward RT yielded 8-pair module with efficiency of 2.8%@100ºC and cooling of 56.5 K [15]. Recently, a single element device of doped Mg_3Sb_2 achieved efficiency ~12% [16].

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