Tohoku Univ. Technology

ZT Measurement of Transverse Thermoelectric Thin Films

Single-setup, single-device measurement of thermoelectric coefficient, electrical conductivity, and thermal conductivity.

Overview

To determine the dimensionless figure of merit ZT of thermoelectric materials, three physical quantities—Seebeck coefficient, electrical conductivity, and thermal conductivity—must be measured separately, which conventionally requires preparing multiple specimens and carrying out time-consuming temperature-dependent measurements.

In addition to conventional longitudinal thermoelectric conversion based on the Seebeck effect, transverse thermoelectric conversion employing the anomalous Nernst effect (ANE) has recently attracted considerable attention. However, for transverse thermoelectric thin films, conventional ZT evaluation requires separate specimens for each of the three properties, and variations in interfacial conditions from sample to sample make accurate determination of ZT very challenging.

The present technology provides a measurement method that enables all-in-one determination of all three key properties in transverse thermoelectric thin films. Because all measurements are performed on a single device with a single setup, the results are free from sample-to-sample variations in interface quality, allowing simpler and faster characterization.

Product Application

- Development of transverse thermoelectric materials for large-area power generation.

IP Data

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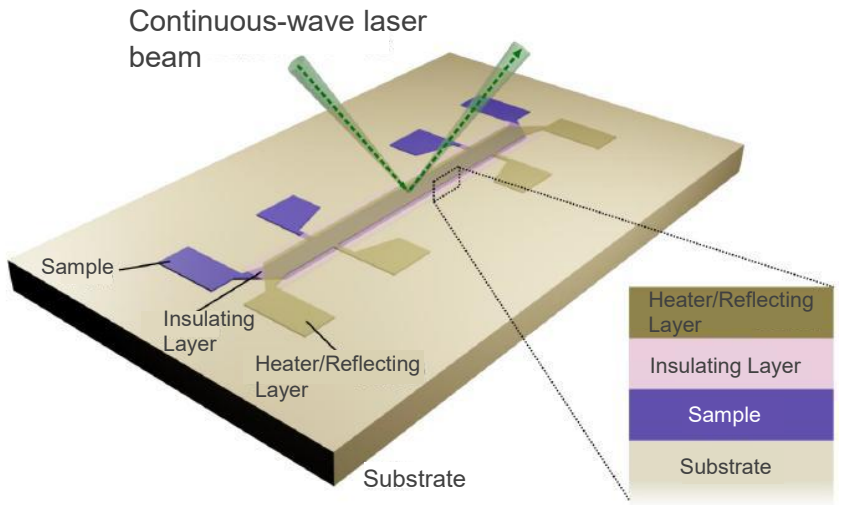
Dimensionless figure of merit of transverse thermoelectric conversion

$$Z_{\mathrm{T}}T = \frac{(S_{\mathrm{T}})^2\sigma}{\kappa}T$$

S_{T} : Transverse thermoelectric coefficient
σ : Electrical conductivity
κ : Thermal conductivity
T : Absolute temperature

System configuration



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