Faculty of Engineering
Tokushima University

Research on Thermoelectric Semiconductor for Exhaust Waste Heat Recovery

Professor Kazuhiro Hasezaki

Fig.1 Photograph of Thermoelectric module

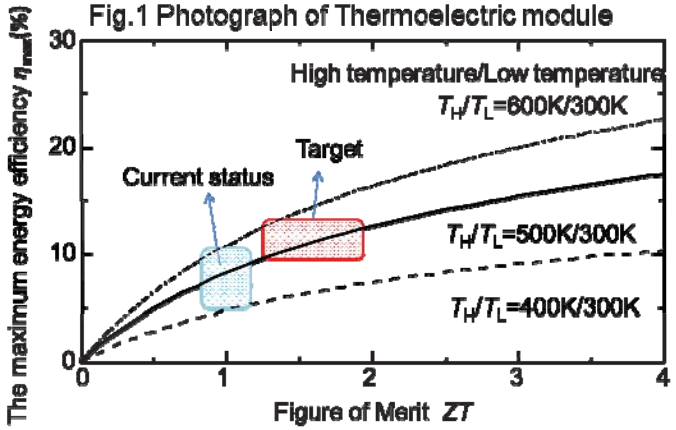

Fig. 2 Relationship of the maximum energy efficiency η_{max} and figure of merit ZT high temperature and Low temperature.

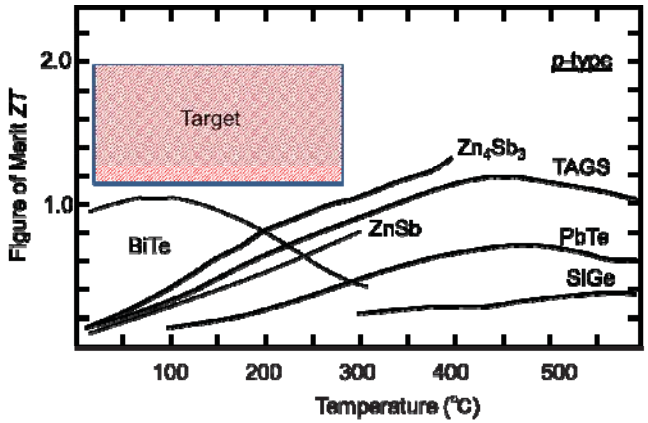

Fig.3 Figure of merit *ZT* versus temperature of thermoelectric materials

Content:

Thermoelectric semiconductor have been widely used as cooling and generating materials. Fig. 1 shows photograph of commercially available thermoelectric cooling module. These materials can be used to recover exhaust heat by thermoelectric conversion. The efficiency of a thermoelectric device is expressed by a dimensionless figure of merit, which is defined as $ZT = \alpha^2\sigma\kappa^{-1}T$, where α, σ, κ, and T are the Seebeck coefficient, electrical conductivity, thermal conductivity, and absolute temperature, respectively. Fig. 2 shows relationship of the maximum energy efficiency and dimensionless figure of merit. The heat of the low temperature range below 500 K generated from industrial apparatus has not been used effectively in the world. In our research, we propose to prepare the thermoelectric generation module for exhaust heat recovery of the low temperature range. We would like to clarify influences by the modularization to the thermoelectric properties of thermoelectric elements. Fig. 3 shows figure of merit versus temperature of thermoelectric materials. Furthermore, it is necessary to improve the figure of merit for BiTe, ZnSb and PbTe thermoelectric materials. We ultimately would like to contribute as the foundation of the effective use technology of exhaust waste heat.

Keywords : thermoelectrics,
energy conversion

E-mail: hasezaki@tokushima-u.ac.jp>
Tel. +81-88-656-7373
Fax: +81-88-656-9082