Thermoelectric properties of full-Heusler Fe_2TiSn sintered samples

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It is commonly believed that the reduction of thermal conductivity is an important problem for improving the thermoelectric properties of the full-Heusler alloy. In this research, focusing on Fe_2TiSn showing a relatively low thermal conductivity among full-Heusler alloys, we paid attention to the advantage of powder metallurgy method that can be processed into a target shape easily and can produce a dense sample with less segregation. Thus, we prepared the stoichiometric composition Fe_2TiSn sintered specimens using powders milled in the air or Ar for 1 hour, 3 hours, and 12 hours, respectively. Here we found that the stoichiometric composition was deviated by the second phase and the temperature at which the Seebeck coefficient changes from p-type to n-type shifted toward the low-temperature side with increasing milling time in samples milled in the air. On the other hand, no change in the Seebeck coefficient due to the milling time was confirmed in the sample milled in Ar. Although no significant change was observed between the electric resistivity and the thermal conductivity in the samples milled in the air and Ar, the phonon scattering at the grain boundary was promoted and the reduction of the lattice thermal conductivity was confirmed with increasing milling time. These observations indicate that the maximum ZT value of the stoichiometric Fe_2TiSn sintered sample milled in Ar for 3 hours is 0.0013 at 305 K as shown in Fig.1.

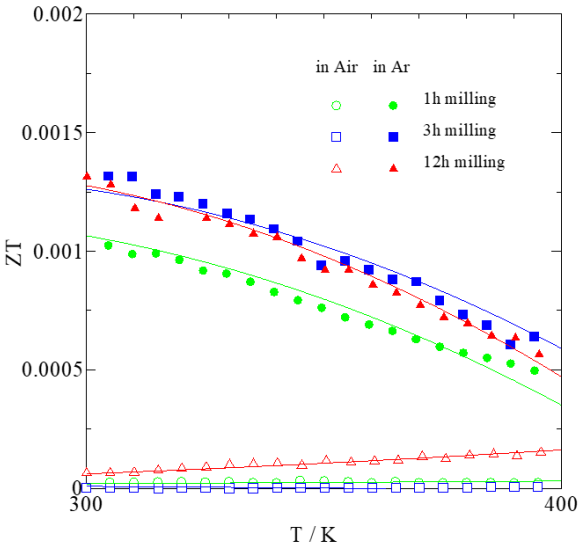

Fig. 1 Temperature dependence of *ZT* for Fe_2TiSn sintered samples.