

## **Thermoelectric characteristics depend on compositions of $\text{Bi}_2\text{Te}_3$ in mixed alloy with PbTe**

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In order to design for nano structured materials with enhanced thermoelectric properties, the alloys in the pseudo-binary  $\text{Bi}_2\text{Te}_3$ -PbTe system were investigated for their micro structure and thermal properties. For this synthesis the liquid alloys were cooled by water quenching method. The micro structure images were taken by using electron probe micro analyzer (EPMA). Dendritic and lamellar structures were clearly observed with the variation in the composition ratio between  $\text{Bi}_2\text{Te}_3$  and PbTe. It was confirmed that a metastable compounds is  $\text{PbBi}_2\text{Te}_4$  in the  $\text{Bi}_2\text{Te}_3$ -PbTe system. The change in the composition increasing  $\text{Bi}_2\text{Te}_3$  ratio causes to change structure from dendritic to lamellar. Seebeck coefficient of alloys 5 which the mixture rate of  $\text{Bi}_2\text{Te}_3$  is 83% was measured as the highest value. In contrast, the others decreased by increasing  $\text{Bi}_2\text{Te}_3$ . n-type characteristics was observed at all condition except alloy 6 which  $\text{Bi}_2\text{Te}_3$  ration is 91%. The power factors of all samples were calculated with Seebeck coefficient and resistivity. Also the thermal conductivity was measured by using laser flash analyzer (LFA). In this work, the microstructures and thermal properties have been measured as a function of ratio of  $\text{Bi}_2\text{Te}_3$  in the  $\text{Bi}_2\text{Te}_3$ -PbTe system.