## Dopant atom influence on the $\alpha \not \rightarrow \beta$ phase transition in thermoelectric $Zn_4Sb_3$

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 $Zn_4Sb_3$  is a high performance thermoelectric material with an extremely high thermoelectric Figure of Merit at relatively low temperatures. Furthermore, previous studies by Jet Propulsion Laboratory have shown that the thermoelectric Figure of Merit can be improved by doping  $Zn_4Sb_3$  with Cd.

Zn<sub>4</sub>Sb<sub>3</sub> exists in three crystalline forms; the  $\alpha$ ,  $\beta$ , and  $\gamma$  phase before melting at 841 K. Only the  $\beta$ -phase (stable between 263 and 765K) has good thermoelectric properties. It is therefore of interest to examine what effect the dopant atom substitutions has on the  $\alpha \rightarrow \beta$  phase transition.

Multi temperature data was measured on a series of  $M_xZn_4-xSb_3$  (M = Hg, Sn, Pb, Mg, Cd) using the large Debye Scherrer camera at beamline BL02B2 at Spring 8 in Japan. The data have been Rietveld refined in order to follow the phase transition.

The physical properties of the samples were measured on a Quantum Design Physical Property Measurement System, to determine the effect of the dopant atom on the thermoelectric Figure of Merit.

[1] Calliat et al., *High-Performance Thermoelectric Materials Based on*  $\beta$ -*Zn4Sb3*, NASA Jet Propulsion Laboratory, Nasatech Briefs, Vol. 23. No. 2 **Keywords: thermoelectric materials, physical properties, Zn<sub>4</sub>Sb<sub>3</sub>**