Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Low Temperature Specific Heat Study on Type I Clathrates
JIAZHEN WU, Graduate school of science, Tohoku University, JINGTAO XU, WPI-AIMR, Tohoku University, GANG MU, DWI PRANANTO, HIDEKAZU SHIMOTANI, Graduate school of science, Tohoku University, YOICHI TANABE, WPI-AIMR, Tohoku University, SATOSHI HEGURI, Graduate school of science, Tohoku University, KATSUMI TANIGAKI, Graduate school of science, Tohoku University; WPI-AIMR, Tohoku University — Zintl phase clathrates, which are featured by the cage framework with guest atoms accommodated inside, are considered as good candidates of thermoelectric materials mainly due to the low thermal conductivity caused by large scattering of the acoustic phonons via the rattling phonons arising from the guest motions [1,2]. The fact has been known so far that, in clathrate $Sr_8Ga_{16}Ge_{30}$ showing off-centered displacement of encapsulated elements, thermal conductivity is suppressed even stronger via the scattering of acoustic phonons by anharmonic rattling phonons. Consequently, further detailed understanding on the anharmonic potentials realized in clathrates is important. In this meeting, we will present our recent studies on low temperature specific heat of type I $Ba_8Ga_{16}Sn_{30}$ and $K_8Ga_8Sn_{38}$ in addition to those of $Ba_8Ga_{16}Ge_{30}$ and $Sr_8Ga_{16}Ge_{30}$ reported previously [2]. The discussion will mainly focus on the separation of the apparent linear temperature dependent terms of anharmonic rattling phonons from those of conduction electrons. The electron phonon interaction strength and the tunneling density of anharmonic potentials will be described on a basis of the analyses. [1] J. Tang, *et al., Phys. Rev. Lett.,* 105, 176402 (2010). [2] J.-T. Xu, *et al., Phys. Rev. B,* 82, 085206 (2010).

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Date submitted: 09 Nov 2012 Electronic form version 1.4