## Nanoscale Physics

# Hysteresis of low temperature thermal conductivity and Boson peak in glassy (g) $As_2S_3$: nanocluster contribution

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Thermal conductivity and heat capacity with low temperature anomalies, the Boson peak in the in glassy materials are still not clearly understood and are matter of debate .We studied thermal conductivity in g-$As_2S_3$ between 2 and 100 K. Thermal conductivity is weakly temperature $\varkappa$(T ) dependent from 2 to 10 K showing a plateau region during both cooling and heating . The jump of value in $\varkappa$(T ) dependence compare with cooling $\varkappa$(T) curves was found during heating g-$As_2S_3$. The values show that the jump of $\varkappa$(T) is greater than the accuracy of the measurement producing an appreciable deviation from k values taken during cooling. The appearance of hysteresis of $\varkappa$(T) during heating was found in range of temperature from 11 to 60 K. Difference curve of $\varkappa$(T) (heating minus cooling) is complex asymmetric peak in energy range from 1 to 10 meV and reproduces the experimental low-temperature Boson peak (BP).Intensity of it being proportional to the density of states (*g(ω)*) by the rule of $g(\omega)/\omega^2$ . Our spectroscopic theoretical and experimental studies of glass structure in cluster approximation have shown that the nature of excitations in the low frequency region of the spectrum might be originate from rich a variety of vibrational properties clusters vibrations resulting from atomic scale disorder [1]. In order to understand how these low frequency-modes depended on system clusters size we focus of attention in this work on the modes which might have vibrational character and be involved in measured low temperature thermal conductivity anomalies and Boson peak in g- $As_2S_3$.

1. *Holomb R., Mitsa V. Johansson, P. , Veres M.* Boson peak in low-frequency Raman spectra of $As_xS_{100-x}$ glasses: nanocluster contribution // Phys. Stat. Sol. C. --2010. – **7**. – P. 885-888.