ULTRASOUND VERSUS THERMAL CONDUCTIVITY IN Ge CLATHRATES.

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New thermoelectric crystalline materials were discovered during last few years. They are called "electron-crystal phonon-glass" (ECPG), because of their property of combining the high electron mobility with the low thermal conductivity. In paper [1] glasslike heat conduction in polycrystalline semiconductors $Sr_8Ga_{16}Ge_{30}$ with type-I clathrate hydrate crystal structure was observed. The lattice thermal conductivity follows a quadratic temperature dependence at low temperatures ($T < 1$ K). In a single crystalline sample of Ge clathrate $Sr_8Ga_{16}Ge_{30}$ the ultrasonic attenuation was measured [2] and it shows T^3 glasslike dependence in this temperature range. It was concluded that this behaviour is attributed to phonon scattering by a broad distribution of two-level systems, which is connected with Sr ions in big 24-vertex polyhedral cages.
In this report we calculate the thermal conductivity in a single crystal $Sr_8Ga_{16}Ge_{30}$ from ultrasonic attenuation data and compare it with data from paper [1]. This conductivity is one order of magnitude higher than the measured value in the polycrystalline sample. The possible physical reason for this discrepancy will be discussed.

[1] J.L. Cohn, G.S. Nolas, V. Fessatidis, T.H. Metcalf, and G.A. Slack, Phys. Rev. Lett. 82, (1999), 779-782.
[2] V.Keppens, B.C. Sales, D. Mandrus, B.C. Chakoumakos, C. Laermans, Phil. Mag. Lett. 80, (2000), 807-812.