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DEPENDENCE OF LORENZ NUMBER ON TEMPERATURE FOR BRASS ALLOYS

By D. Włosewicz, K. Bartkowski and J. Rafałowicz

Institute of Low Temperature and Structure Research, Polish Academy of Sciences, Wrocław*

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Lorenz number versus temperature dependence $L(T)$ was found to be similar in shape to the temperature dependence of the lattice brass thermal conductivity component. The $L(T)$ reaches a maximum where lattice thermal conductivity maximum exists.

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Usually one assumes that the Lorenz number L is expressed by the formula

$$L = \frac{\lambda \varrho}{T}. \tag{1}$$

From the formula it is obvious that L for alloys exceeds the Sommerfeld theoretical value $L_0 = 2.445\ 10^{-8}\ \mathrm{W\Omega/deg^2}$ because λ is the sum of the electronic λ_e and lattice λ_l thermal conductivity components.

In figures 1 and 2 the Lorenz number dependence on temperature for the investigated CuZn samples is shown. On the graphs one can see that the character of the Lorenz number temperature dependence curves $L(T)$ is similar to the thermal conductivity temperature dependence plots $\lambda_l(T)$ for corresponding samples. At very low temperatures, the Lorenz number reaches a value near L_0 because, at these temperatures, λ_l makes a small contribution to the thermal conductivity. Next, $L(T)$ grows and reaches a maximum at temperatures where there is also a maximum for the thermal conductivity lattice component. Further on the value of L decreases with increasing temperature and then $L(T)$ resumes increasing, slowly.

The $L(T)$ plot was observed to be dependent on sample purity. The more impure the sample, the more L deviated from L_0, as previously observed for other substances [1–3].

* Address: Instytut Niskich Temperatur i Badań Strukturalnych PAN, Próchnika 95, 53-529 Wrocław, Poland.

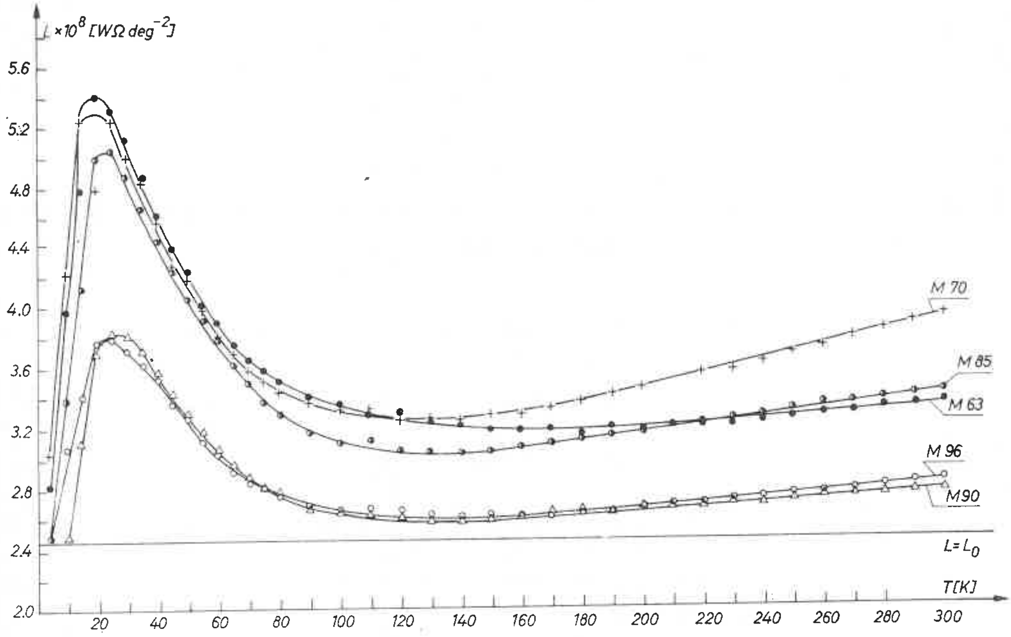

Fig. 1. Plot of Lorenz number vs. temperature for samples: M96, M90, M85, M70, M63

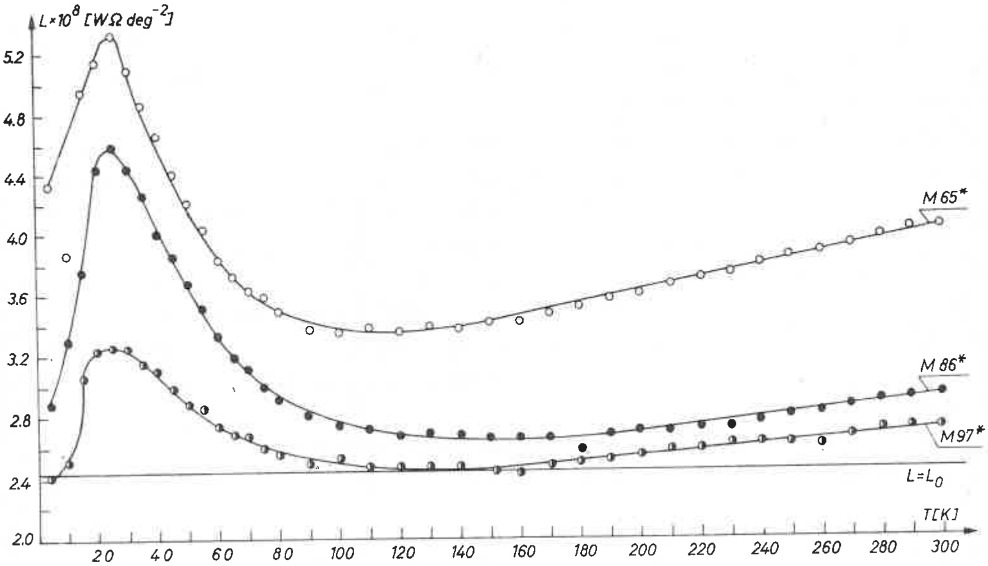

Fig. 2. Plot of Lorenz number vs. temperature for samples: M97*, M85*, M86*

REFERENCES

[1] A. E. Whiteman, J. J. Martin, H. R. Shanks, *J. Phys. Chem. Solids* **32**, 2223 (1971).

[2] A. Missenard, *Conductivité Thermique des Solides, Liquides, Gaz et de Leurs Mélanges*, Russian translation, Izdat. Mir, Moskva 1968.

[3] R. E. Kzhizhanovsky, N. P. Sidorova, I. A. Bigdanova, *Inzh.-Fiz. Zh.* **26**, 46 (1974).