The calculations of electronic transport coefficients in nickel plasma.

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The electronic transport coefficients (conductivity, thermal conductivity and thermal power) are studied for more than a century. But the high-temperature (plasma) area of phase diagram of metals is a challenge for measurements. As a result, it is studied much less than the liquid or the solid states. This region is located approximately at the temperatures $T > 5 \text{kK}$ and the densities less than normal one. During many years there were only the calculations of the considered coefficients in plasma for most of metals in this high-temperature region (see [1-3] and references therein). But recently new experiments have been carried out in the plasma region, although the temperature in these experiments has not been measured directly [1-4]. This new data can be used to check the existing theoretical models and calculations. Previously, we have developed the model for the transport coefficients calculations within the relaxation time approximation. The composition of plasma, i.e. the number of positive ions, electrons, atoms etc, has been obtained by means of corresponding chemical model. The latter allows one to calculate the pressure as well. Our approach has been successfully applied earlier to the plasma of noble gases, metals and semiconductors [5-7]. Presently we have applied our model for the calculations of pressure and the considered coefficients for the plasma of Ni. The measurements for nickel plasma are presented in [1, 2, 4] under the temperatures more than 10 kK. In [1] the isochores 0.1 g/cm$^3$ was studied, while in [2, 4] the isotherms 8-30 kK (or quasi-isotherms) were considered for the densities less than normal one. Our calculations have been carried out under the same conditions. The obtained results are in good agreement with these measurements as well as with the results of calculations of other researchers.

References