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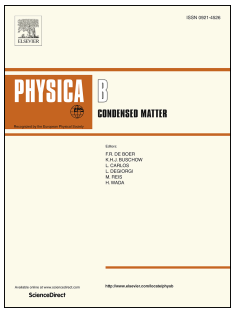

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ACCEPTED MANUSCRIPT

Analytical estimation of temperature dependence of electrical resistivity with heat treatment temperature of graphitizing carbon materials.

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Abstract

First of all, the temperature dependence of the electrical resistivity of the single-crystalline graphite was analyzed by combining the simple two-band (STB) model of the π-electron band structure of graphite with the proper scattering law.

Then, the regression equations for the change of resistant characteristic factors(that is, crystallite size, average kinetic momentum of carriers, correction coefficient of resistivity, energy band gap and so on) according to the heat treatment temperature of graphitizing carbon materials, were estimated analytically on the basis of the preceding literature and their physical consideration.

By introducing the above regression equations for the resistant characteristic factors into the analytic expression for the electrical resistivity of single-crystalline graphite, the universal formula to calculate numerically the temperature dependence of the electrical resistivity with heat treatment temperature of the graphitizing carbon materials, was obtained.

So, the correctness of the numerically- calculated results based on this theoretical formula was proved by contrasting them with the preceding experimental results.

As a result, the temperature dependence of the electrical resistivity with heat treatment temperature of the graphitizing carbon materials can be estimated easily by the method of computational physics

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