Anisotropy of the Thermal Expansion Coefficient of Pressed Graphite Foam

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Abstract

The purpose of this note is the study of the thermal expansion coefficient (a(T)) anisotropy in pressed graphite along the strong-interaction direction, over the temperature range [25-500°C]. After suitable processing, the material obtained is thermally-dilated graphite, known as graphite foam. a(T) is measured along three directions. Each of the three curves exhibits one dilatometric anomaly which differs from one direction to another. On the a3 curve, measured along the direction normal to the pressing plane, it is very pronounced. This implies that the membrane effect is very important along this direction. Calorimetric measurements confirm the presence of this anomaly. The obtained results and the shape of the curves in this work differ essentially from those published in the literature. Thus, pressing has completely altered the dilatometric behaviour of the graphite foam. It is at the origin of the big increase in a(T) along the direction of strong interactions. There is a slight increase in the inter-layer spacing, while the density of the material significantly decreased. Additionally, stronger anisotropy in a(T) results from pressing. This behaviour agrees well with measured electrical conductivity and thermal conductibility data, thus confirming the anisotropic nature of this material.