

Lonsdaleite in nanodiamonds

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Lonsdaleite (hexagonal diamond) for the first time has been found out and identified as fine inclusions in meteoric carbonaceous materials.

Later hexagonal diamonds have been found out in a number of geological place origins and in disperse powders of diamonds dynamic synthesis.

Use in our work of specially developed technique of X-ray analysis has shown, that the maintenance lonsdaleite in them can reach ~ 60% and synthesis in the field of thermodynamic stability hexagonal diamond (1,2) has allowed received samples with its concentration more than 90%.

However in the pure state it is not received yet, therefore its many physical properties remain unknown persons, as well as lonsdaleite mechanisms of its formation hexagonal structures since it corresponds to structure of defects of packing in planes (111) cubic diamond. It enables to consider shift supersonic (deformation, as a principal cause of formation hexagonal diamond. However in other cases, probably, are not excluded also other alternative mechanisms, for example martensite transformation, etc.

Energy and coordination of nuclear communications, density cubic diamond and hexagonal diamond are completely identical to parameters, therefore their elastic parameters, most likely, are close, but conditions of transformation of one structure in another, also as well as properties cubic-hexagonal diamond compositions, practically are not studied.

Results of researches of processes of transformation containing lonsdaleite nanodiamonds to cubic diamond, graphite or other forms carbon of materials under influence of various factors are presented in our work.

Our studies showed, that increase of concentration hexagonal diamond in natural diamonds approximately up to 40% reduces hardness of diamond, but, at the same time, density a nanodiamond compound increases with increase in the maintenance lonsdaleite.

Cubic-hexagonal diamond compositions, especially, considering characteristic for them structure, are represented by rather perspective base for creation of new super firm materials with the raised viscosity of destruction.

[1] Bundy T., Kasper J., *J. Chem. Phys.* **46**(9), (1967).

[2] Kurdyumov A.V., etc. "Crystal structure lonsdaleite, formed at High statistical pressure." "Physics and technique of high pressures ", Kiev, 1981.