

[o.m7.p1] Intergrowth Phases of Rare Earth Boride Carbides and the Structure of Interfaces. O. Oeckler¹, J. Bauer², H. Mattausch¹, A. Simon¹, ¹*Max-Planck-Institut fuer Festkoerperforschung, 70569 Stuttgart, Germany;* ²*Laboratoire de Chimie du Solide et Inorganique Moléculaire, CNRS, 35042 Rennes, France.*
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The crystal structures of many rare earth (Ln) boride carbides can be described as stacking sequences of primitive square nets of metal atoms. Depending on the relative orientations of consecutive layers, different types of voids result to be filled with interstitial atoms or quasimolecular B_xC_y units. In some cases also infinite B-C substructures are present¹.

Among many different phases, two structure types exhibit a remarkable stability range. Several types of disorder and non-stoichiometry concerning the interstitial species occur. In the tetragonal phases (sp. gr. *P4/ncc*) of the nominal composition $Ln_5B_{\approx 2}C_{\approx 5.7}$ octahedral voids exist which can be empty or filled with discrete carbon atoms and/or C_2 units as well as larger voids (bicapped tetragonal antiprisms) containing CBC or CBCC groups. The antiprisms are joined via faces and form boron-containing metal atom double layers. The phases $Ln_3B_xC_{4-x}$ (sp. gr. *P4/mnc*) are very similar but contain additional metal-carbon layers between the boron-containing double layers. This structure type is derived from the Sc_3C_4 type² by replacing G units by CBC units. 100% replacement corresponds to the idealized formula $Ln_{15}B_4C_{16}$.

Both compounds tend to be twinned in the same way. The twin interfaces are planar square nets of metal atoms shared by two domains. It could be shown by a series of X-ray structure determinations on twinned and grown-together crystals as well as by high-resolution electron microscopy (HRTEM) that common square nets are not only the reason for twinning but also for the occurrence of coherent interfaces between domains of the two structure types mentioned above. The domain sizes can vary from grown-together macroscopic crystals to lamellar domains only a few unit-cells thick. Statistical intergrowth of metal atom layers yields a phasoid.

HTREM investigations revealed a series of new intergrowth compounds where small domains of the two types are stacked alternately with considerable long-range order. In other words, there are additional metal-carbon layers only between some of the double layers of the $Ln_5B_{\approx 2}C_{\approx 5.7}$ type in a regular sequence. For example, the phase of the ideal composition $Ho_{25}B_8C_{26}$ has been observed in four polymorphic variants with translation periods of up to 54 Å. More complicated but well-ordered stacking sequences are present in compounds with almost the same stoichiometry, e. g. $Ho_{45}B_{16}C_{46}$ or $Ho_{20}B_6C_{21}$.

[o.m7.p2] Physisorption Studies on Carbon Nanotubes. A. Bougrine*, M. Muris**, M. Bienfait**, D. Billaud*, N. Dupont-Pavlovsky*, E. McRae*, **L.C.S.M., UHP-Nancy I;* ***CRMC2, CNRS, Marseille.*
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Physisorption of noble gases and simple molecules on various types of carbon nanotubes is shown to be a powerful characterisation technique, complementary to those more generally used such as diffraction and microscopy. Single and multi-walled nanotubes from different sources have been examined using adsorption isotherms. We have investigated in particular the low relative pressure range ($P/P_{saturation} < 0.001$), which gives the most information concerning the substrate characteristics and the adsorbate-adsorbent interactions. These curves exhibit steps representative of the adsorption on comparatively uniform surface patches. The results are analysed with respect to graphite, a reference uniform substrate. Comparison of step pressures and heights allows obtaining some information on the extent and nature of the different adsorption sites and thus furnishes an overall evaluation of certain morphological features distinguishing different kinds of tubes.

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