

07.1-1 GROWTH FORM OF CRYSTALS. DETERMINATION BY FOURIER TRANSFORM OF MORPHOLOGY. BY H. Föllner, Institut für Mineralogie und Mineralische Rohstoffe, Technische Universität, Clausthal, Federal Republic of Germany.

Crystals are based on a morphological lattice which, as a rule, shows a higher symmetry than that of the structural lattice. The morphological lattice of a crystal is determined by a Fourier transform of crystal morphology under consideration of the morphological extinction rules. The Dirichlet domain of the morphological points is the reciprocal crystal. The arrangements of the polyhedra parallel to the crystal planes are of importance for the appearance of these planes. The bond strength between neighbouring morphological units is proportional to the area of the common polyhedron face. A Fourier transform of the reciprocal crystal leads to the reciprocal morphological translation lattice from which are taken the central distances for the calculated crystal. The growth rates of crystal faces can be calculated by equation (1):

$$\sigma' = \frac{1}{2} \cdot \frac{N}{V} \cdot \frac{n}{N} \cdot \sum_i \frac{|W(i) \cdot W(hkl)|}{|W(i)| \cdot |W(hkl)|} \cdot \phi(i)$$

$$= \frac{n}{2V} \cdot S(hkl) = \frac{1}{2} \cdot d^* (nh, nk, nl)$$

$W(i)$ is the vector between neighbouring morphological points ($W(hkl)$ (hkl) vector in reciprocal space). The $\phi(i)$ -values are equated with the areas of the polyhedron faces of the reciprocal crystal. n depends on the number of morphological units per growth layer and on the translation symmetry of the reciprocal translation lattice. The thickness of the growth layer is determined by the morphological extinction rules. The σ' -values are the central distances of a Dirichlet domain of the reciprocal morphological lattice with the origin as central point.

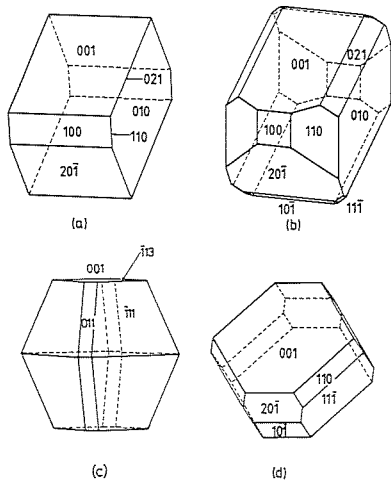


Fig. 1. Wulff-plots of high-sandine (Z. Krist.in press). (a) The polyhedron was constructed with central distances calculated with equation (1). The growth form has common edges with (110) and (021). (b) The central distances on which the polyhedron is based deviate from the ideal values in (a) by maximally 10%. Theoretical growth forms (c) of α -sulphur ((113) runs practically through the edge formed by (111) and (001)) and (d) of anthracene. The polyhedra (a) and (d) are Dirichlet domains of a homogeneous partition of the three-dimensional space.

07.1-2 GROWTH & NUCLEATION STUDIES OF SELECTED METAL ISOTOPES USING A MINIATURISED ELECTROCHEMICAL CELL. C.E.Hall, H.J.Milledge (Crystallography Unit, Geology Department) and M.H.B.Stiddard (Chemistry Department), University College London, Gower Street, LONDON WC1E 6BT, UK.

An apparatus originally designed for the study of multiply-twinned particles of silver has been miniaturised to enable single crystals of individual metal isotopes to be obtained from solution volumes of the order of 1 cc, containing of the order of 10 mg of isotope; up to 90% of the metal can be incorporated in one crystal nucleated on a microelectrode.

The method has a number of advantages for isotope work, because unsatisfactory crystals can be redissolved without loss, and the experiment repeated, and even when good single crystals cannot be obtained, good microcrystals suitable for powder diffraction work can be grown.

The experimental system also permits comparative nucleation data for different isotopes of the same element to be obtained, because the application of nucleation theory to systems which involve electrochemical deposition only requires a redefinition of the supersaturation parameter in terms of the overpotential. This provides a very precise method of controlling the supersaturation, thus facilitating the study of other nucleation parameters.

The control system has been developed to permit the continuous recording of a long sequence of nucleation events occurring under controlled conditions, and procedures are being developed for the statistical analysis of these sequences.

Provision has also been made for the measurement of current/time (I/t) curves which accurately reflect the growth behaviour.

07.1-3 GROWTH OF $(Y_{1-x}Ce_x)_2Co_{17}$ SINGLE CRYSTAL COMPOUNDS. By A.Modrzejewski, M.Ślepowroński and S.Warchoł, Institute of Atomic Energy, 05-40Q Swierk, Poland.

The modified Bridgman technique (Warchoł and Modrzejewski, Cryst. Res. Technol. (1982) 17, 1347) was used for the growth of sizable single crystals of $(Y_{1-x}Ce_x)_2Co_{17}$. Rare earths were melted in cobalt container placed in BN coated alundum crucible. An excess of about 3% rare earth was used to obtain stoichiometric compositions. The growth rate was 1.5 mm/h. Metallographic examination of the specimens has shown the existence of different crystal defects in some ingots. The structural homogeneity differs slightly from the first to last to freeze parts of the ingots.

$(Y,Ce)_2Co_{17}$ is an example of mixed valency system: cerium metal exhibits intermediate valency, usually between 3.0 and 3.4 as well in the metallic state as in compounds. The purpose of the present work was to show how did the composition influence the structural and magnetic properties of $(Y_{1-x}Ce_x)_2Co_{17}$ compounds. Magnetic measurements are under way.