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## *Recent Soviet Work on the Dielectric Properties and Sintering of Alumina*

Readers of the review by Perry [*J. Matls. Sci.* **1** (1966) 186] recently published in this Journal may be interested in the following short bibliography of papers on alumina recently published by members of the Ukrainian Institute for the Scientific Study of Refractories.

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3. E. V. DEGTYARYOVA, I. S. KAINARSKI, and C. B. TOTSENKO, "Sintering of Alumina containing Additions", *Ogneupori* (*Refractories*) (1964) part 9, 400.
4. I. G. ORLOVA and R. E. MIRKINA, "Influence of Microstructure on the Ordinary Elastic Modulus of Alumina Ceramics", *Ogneupori* (1964) part 8, 378.
5. I. S. KAINARSKI, E. V. DEGTYARYOVA, and L. S. ALEKSENKO, "Anisotropy of Shrinkage during the Sintering of Alumina", *Ogneupori* (1964) part 10, 455.
6. I. S. KAINARSKI, E. V. DEGTYARYOVA, and I. G. ORLOVA, "Interrelation of Electrical and Mechanical Stability of Alumina Ceramics", *Doklady Akad. Nauk SSSR* **157** (1964) 168.
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11. E. V. DEGTYARYOVA, "Grain Growth in Alumina during Sintering", *Doklady Akad. Nauk SSSR* **165** (1965) 372.
12. I. G. ORLOVA, "Mechanism of Deformation during the Heating of 'Unburnt' Alumina Ceramics", *Doklady Akad. Nauk SSSR* **165** (1965) 387.
13. E. V. DEGTYARYOVA, "Kinetics of Elimination of Closed Porosity in Alumina and the Production of Transparent Alumina Ceramics", *Izv. Akad. Nauk SSSR* (*Seriya Neorganicheskie Materialy*) (translation, "Inorganic Materials", published by the Consultants Bureau) **1** (1965) 281.
14. I. G. ORLOVA, I. S. KAINARSKI, and M. I. PROKOLENKO, "Influence of Modifying Additives on the Stability of Alumina Ceramics", *Izv. Akad. Nauk SSSR* (*Seriya Neorganicheskie Materialy*) (see note to reference 13) **1** (1965) 804.
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19. I. G. ORLOVA, I. S. KAINARSKI, and R. E. MIRKINA, "Influence of the Mode of Preparation of the Raw Material on the Deformation of Alumina during Kilning", reference 17, section 5, page 3.
20. E. V. DEGTYARYOVA and I. S. KAINARSKI, "Kinetics of Sintering of Alumina under Pressure", *Izv. Akad. Nauk SSSR* (*Seriya Neorganicheskie Materialy*) (see note to reference 13) **2** (1966) 239.
21. I. S. KAINARSKI. E. V. DEGTYARYOVA, I. G. ORLOVA, and A. G. KARAULOV, "Influence of the Mode of Vibratory Milling of Alumina Powder on the Properties of the Product. Sintering and Consolidation during Kilning and Properties of Aluminium Products", *Ogneupori* (1966) part 2, 25.

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# Book Reviews

## The Growth of Crystals from the Melt

Selected Topics in Solid State Physics, V

*J. C. Brice*

Pp x + 192 (North-Holland Publishing Co, 1965) 50*s*

This book is a very welcome addition to the very limited number of books dealing with the growth of single crystals, a subject of which the importance is now receiving wide recognition. The book deals with the theory and practice of crystal growth from pure and doped melts.

The various methods of crystal growth are treated in detail in Chapters 5 to 7 under the headings *Growth in Crucibles*, *Crystal Pulling*, and *Growth without Crucibles*. These chapters are preceded, in Chapter 4, by a discussion of the basic techniques, common to all methods, of heating, temperature measurement, temperature control, crucible design and materials, and atmosphere control. All these chapters give a clear description of the practical techniques and the important criteria in the design of apparatus; they reveal the author's extensive practical experience of crystal growth.

Chapter 3 concerns the macroscopic distributions of impurities obtained with normal-freeze and zone-melting processes. These are treated in considerable detail both for perfectly-stirred and for partially-stirred melts, the latter being discussed in terms of the concept of the effective distribution coefficient. The effect of volatilisation of impurity from the melt is also taken into account. The chapter concludes with a section on chemical inhomogeneities in crystals in which are discussed orientation-dependent distribution coefficients (the facet effect) and impurity striations. Whilst the important concept of constitutional supercooling is fully treated in Chapter 2, the inhomogeneities which arise from it are not described in detail anywhere in the book.

The bulk of the theory of crystal growth from the melt is contained in Chapter 2, entitled *The Kinetics of Growth from the Melt*. It includes the use of free-energy polar diagrams to determine the equilibrium shape of crystals (though the fact that such a consideration is important only for very small crystals is not stated), nucleation phenomena, growth on different types of interfaces, dendritic growth, constitutional supercooling, and the concept of an interface distribution coefficient and its relationship to the equilibrium distribution coefficient. The subject matter covered in this chapter is so extensive that it is more in the nature of a review.

This leaves Chapter 1 – a curious chapter, entitled *Gases, Solids and Liquids*, and containing such topics as the kinetic theory of gases, crystal lattices, melting, intrinsic and grown-in defects; the last named is treated very superficially. The important subject of phase equilibrium is treated very briefly by refer-