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Thermodynamic evaluation of nucleation as a method for selection of aluminium nitride modifications

Kudyakova V.S.^{1}, Shishkin R.A.¹, Zykov F.M.¹, Zvonarev K.V.¹, Chukin A.V.¹, Polyakov E.V.²,
Beketov A.R.¹*

¹Ural Federal University, 19 Mira st., Yekaterinburg, 620002

²Institute of Solid State Chemistry UB RAS, 91, Pervomaiskaya St, Yekaterinburg, 620990

valeriya_kudyakova@mail.ru

Keywords: cubic aluminium nitride, properties, synthesis, metastable modifications, thermal conductivity

Abstract

The Volmer and Wulf models have been used to study the process of nucleation of aluminium nitride modifications. The sizes of the critical nuclei of aluminium nitride modifications have been determined depending on the degree of supersaturation. It has been demonstrated that by varying the technological parameters of chemical vapour deposition it is possible to determine the conditions for selection of AlN modifications.

Keywords: A1.Nucleation; A1.Surface structure; B1.Nitrides; A3.Chemical vapor deposition processes

Introduction

The properties of aluminium nitride are highly requested in different industries. The optoelectronic properties of aluminium nitride enable its application as LED and PCB elements [1-3], while its high thermal conductivity allows it to be used as brackets for LED technology, ceramic substrates [4,5] and thermal interfaces for electronic lasers [3]. AlN is used in the production of solid-state cells that are photosensitive to ultraviolet radiation due to its wide bandgap [6]. AlN films, in particular on flexible polymer substrates, can find application as highly sensitive pressure [7] and ME sensors [8].

Besides the electronic industry, aluminium nitride is widely used for the development of composite materials with a high electrical resistance [9], thermal conductivity [10,11] and mechanical strength [13].

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