LAYERED COMPOSITE STRUCTURES SYNTESIS β-SiC - DIAMOND BY MICROWAVE PLASMA CVD IN H_2-CH_4-SiH_4 GAS MIXTURES

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In this work we present the synthesis of a composite structure: diamond on a cubic polytype silicon carbide layer (β-SiC).

Diamond is widely used in electronics, optics, biology and medicine [1]. Silicon impurities in diamond tend to form «silicon-vacancy» color centers (SiV), which can be used for optical biomarkers in medicine and single photons sources in quantum optics [2]. Higher concentrations of silicon allow the formation silicon carbide (SiC), which has excellent semiconducting properties for high temperature applications. Formation of a composite material «Diamond – SiC» is an important task for electronics and quantum optics.

Single crystalline silicon substrate (100) was spin-coated with diamond nanoparticles. Diamond growth was performed with chemical vapor deposition technique in a microwave reactor ARDIS-100 (2.45 GHz) in the "methane-hydrogen-silane" mixtures at flow ratio SiH_4 / CH_4 from 0 % to 50 %. The change in the growth regime allowed us to first obtain a layer of β-SiC with individual crystallites of diamond, and then a layer of solid diamond (Fig.1a).

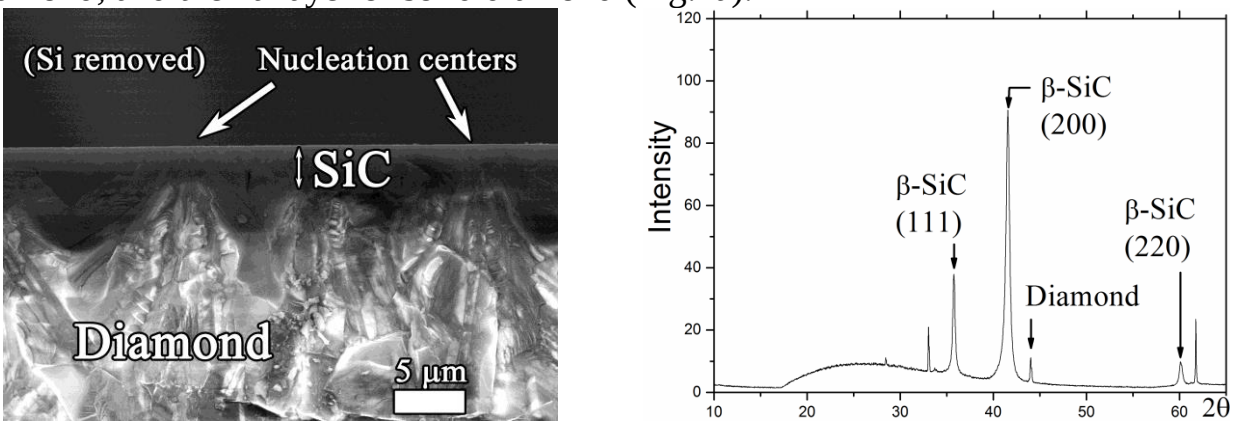

Fig. 1 (a, b). (a) SEM images chip of the sample: the composite structure of "β-SiC-diamond"; (b) Diffractogram of the composite "β-SiC-diamond".

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