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Temperature Effect On Structural Properties Of Boron Oxide Thin Films Deposited By MOCVD Method

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Boron oxide thin films were deposited on Si(100) substrates using a single source precursor by thermal MOCVD method under the condition that in the range of 500-650 °C, and 150 mTorr, respectively. Tri-isopropyl borate ($[(CH_3)_2CHO]_3B$) was used as precursor without carrier and bubbler gases then the deposition was lasted for 3 hrs. In this study, the structural properties of boron oxide thin films with various deposition temperatures were mainly investigated. XRD data show that a highly oriented cubic B2O3 thin film in the [310] direction was grown on Si(100) substrate at 500-650 °C and 150 mTorr. XPS analysis shows that the chemical composition of as-grown film at 550-650 °C and 150 mTorr has a non-stoichiometric value of B_2O_{3+x}, and a stoichiometric value of B_2O_3 film. From IR and Contact angle value analysis, we can see that crystallinity of the deposited films were decreased by B-O-H bond formation. The morphology and film thickness of the as-grown films were observed by SEM. These average grain sizes and film thickness show in the range of 20-50 nm and 400-900 nm depending on deposition temperature. With increasing deposition temperature, we obtained that the improvement of the crystallinity to become more stoichiometric films and the grain size as well as film thickness are also increased. We found that structural properties of the as-grown Boron oxide thin films were strongly dependent on deposition temperature.