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Experimental Investigations of the Bismuth Oxide Film Grown by Atomic Layer Deposition Using Triphenyl Bismuth

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Abstract

Bismuth oxide thin films have been produced from the precursor of triphenyl bismuth and ozone by using the atomic layer deposition (ALD) technique. The growth rate of 0.23 Å/cycle is independent to deposition temperature at the range of 250 ^{o}C to 320 ^{o}C, and the self-limiting saturated adsorption of ALD for bismuth-source and oxygen-source precursors was verified. The films obtained in the ALD window (between 250 ^{o}C and 320 ^{o}C) have an indirect band gap of ~2.77 eV that is compatible with $Bi_2O_{3-\delta}$.High-resolution transmission electron microscopy reveals a mixed growth mode, horizontal growth initially, and subsequent vertical/island growth during the deposition process.

Keywords: mixed growth mode; atomic layer deposition; nanofabrication; bismuth oxide; triphenyl bismuth

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