

스퍼터링 방법으로 성장시킨 나노구조의 Ga 농도 변화에 따른 형상 변화

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ZnO is of great interest for various technological applications ranging from optoelectronics to chemical sensors because of its superior emission, electronic, and chemical properties. In addition, vertically well-aligned ZnO nanorods on large areas with good optical and structural properties are of special interest for the fabrication of electronic and optical nanodevices. To date, several approaches have been proposed for the growth of one-dimensional (1D) ZnO nanostructures. Several groups have reported the MOCVD growth of ZnO nanorods with no metal catalysts at 400 °C, and fabricated a well-aligned ZnO nanorod array on a PLD prepared ZnO film by using a catalyst-free method. It has been suggested that the synthesis of ZnO nanowires using a template-less/surfactant-free aqueous method.

However, despite being a well-established and cost-effective method of thin film deposition, the use of magnetron sputtering to grow ZnO nanorods has not been reported yet. Additionally, magnetron sputtering has the advantage of producing highly oriented ZnO films at a relatively low process temperature.

Currently, more effort has been concentrated on the synthesis of 1D ZnO nanostructures doped with various metal elements (Al, In, Ga, etc.) to obtain nanostructures with high quality, improved emission properties, and high conductance in functional oxide

semiconductors. Among these dopants, Ga-doped ZnO has demonstrated substantial advantages over Al-doped ZnO, including greater resistance to oxidation. Since the covalent bond length of Ga-O (1.92 Å) is nearly equal to that of Zn-O (1.97 Å), high electron mobility and low electrical resistivity are also expected in the Ga-doped ZnO. In this article, we report the successful growth of Ga-doped ZnO nanorods on c-Sapphire substrate without metal catalysts by magnetron sputtering and our investigations of their structural, optical, and field emission properties.

Keywords: Ga, Sputtering, nanorod

HIGH-THROUGHPUT PROCESS FOR ATOMIC LAYER DEPOSITION

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Atomic layer deposition (ALD) have been proven to be a very attractive technique for the fabrication of advanced gate dielectrics and DRAM insulators due to excellent conformality and precise control of film thickness and composition. However, one major disadvantage of ALD is its relatively low deposition rate (throughput) because the deposition rate is typically limited by the time required for purging process between the introduction of precursors. In order to improve its throughput, many efforts have been made by commercial companies, for example, the modification reactor and development of precursors. However, any promising solution has not reported to date.

We developed a new concept ALD system (Lucida™ S200) with high-throughput. In this process, a continuous flow of ALD precursor and purging gas are simultaneously introduced from different locations in the ALD reactor. A cyclic ALD process is carried out by moving the wafer holder up and down. Therefore, the time required for ALD reaction cycle is determined by speed of the wafer holder and vapor pressure of precursors.

We will present the operating principle of our system and results of deposition.

Keywords: atomic layer deposition, high throughput