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수소의 영향에 따른 FBAR용 ZnO 박막의 구조적, 전기적 특성
Effect of Hydrogen on the Structural and Electrical Properties of ZnO Thin Films for FBAR

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Zinc oxide (ZnO) is an n-type semiconductor with a direct transition band gap structure of 3.2 eV and possesses high optical transparency in the visible wavelength range as well as high piezoelectricity. ZnO films have attracted considerable attention for transparent electrodes in flat panel displays, thin film transistors and solar cells in place of indium tin oxide films, and acoustic elements in piezoelectric based devices such as surface acoustic wave (SAW) filters and film bulk acoustic resonators (FBAR) due to its piezoelectric characteristics. Recently, many methods have been used to prepare piezoelectric ZnO thin films including chemical vapor deposition, sputtering, and laser ablation. Among these deposition methods, sputtering is considered to be most favorable because it is possible to obtain highly oriented uniform ZnO films even on amorphous substrates. Actually, FBAR devices based on bulk micromachining process request high oriented ZnO films on metal bottom electrode. Among many configurations, several notable results have been reported from observations on hydrogen in a compound semiconductor ZnO, which has attracted much interest as a transparent conducting oxide material for optoelectronics, solar cell, and heat mirrors. For this reason, in this work, we report on the deposition and structure properties of ZnO:H film with increasing hydrogen flow ratio. It was shown that the microstructure and electrical properties depend on the hydrogen flow ratio. Based on SEM, AFM, XRD, piezoelectric coefficient (d_{33}) and impedance analysis, possible mechanism for explaining the hydrogen flow ratio effect on the characteristics of ZnO:H films was suggested.