Transparency Conducting AZO Films by Using DC Sputtering and RF Sputtering

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The transparent conducting thin films were sputtered at 2, 4, 6, 8, and 10mtorr by DC sputtering method, and at 4, 6, 8, and 10mtorr by RF sputtering method, respectively. A DC power and an RF power were introduced into the cathode of the sputtering system respectively to deposit AZO films. The RF power was kept at 150W, and the DC power was kept at 80W during deposition. Five substrate temperatures, 225, 250, 275, 300, and 325 °C were chosen for deposited. Transmittances of the films are all above 80% within 400-800nm incident light. No blue shift of the transmission has been observed for the RF sputtering method, but has been observed for the DC sputtering method. The blue shift of the transmittance with higher deposition temperature for the DC sputtering method could be due to Burstein-Moss shift. The X-ray diffraction peak intensity increases with the increasing substrate temperature both for DC and RF sputtering methods. Another diffraction peak of (331) was observed as the substrate temperature increases to 275 °C. This could be due to the phase changes of the AZO films. As the substrate temperature increases from 225 to 325 °C, the increasing diffraction peak intensity of (002) is primarily due to the crystallization of the AZO film.