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**Application of Toroidal Magnetron Sputtering system: characteristics of ZnO:Al thin films** YONGHYUN KIM, YOUNG-WOO KIM, DAE-CHUL KIM, JONG-SIK KIM, JUNG-SIK KIM, National Fusion Research Institute — To improve the disadvantages of the conventional magnetron sputter such as substrate heating by thermal radiation and damage of film surface by high energetic particles, etc., a newly designed Toroidal Magnetron Sputtering (TMS) system has been developed[1] and aluminum-doped zinc oxide (AZO) thin films were deposited on glass substrate at room temperature. The structural, electrical and optical properties of AZO films were investigated with DC power and oxygen gas ratio below 1 % at a pressure of 1.7 mTorr. We obtained the AZO films with a resistivity of around  $8.0 \times 10^{-4} \Omega \text{ cm}$  and an average transmittance of 90 % in visible wavelength. Also the grain size of all AZO films kept about 30 nm, even though the different crystallinity. However, the mean free path of carriers was 1.5 to 2.5 nm and the carrier concentration was above  $1 \times 10^{20} \text{ cm}^{-3}$ . These results reveal that the mobility of AZO thin films does not depend on grain boundary scattering in our experiment.  
[1] Thin Solid Films 518 (2010) 6650-6653

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