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ICP-Enhanced Sputter Deposition for Reactivity Control and Low-Temperature Formation of a-IGZO Films[1] YUICHI SETSUHARA, KEITARO NAKATA, YOSHIKATSU SATAKE, KOSUKE TAKENAKA, GI-ICHIRO UCHIDA, Osaka University, AKINORI EBE, EMD Corporation — Inductively coupled plasma (ICP) - enhanced sputter deposition for a-IGZO channel TFTs fabrication have been performed. This advantage of fine control of reactivity during the deposition process is of great significance for film deposition of the transparent amorphous oxide semiconductor, a-InGaZnO$_x$ (a-IGZO), whose electrical properties are significantly sensitive to the reactivity during the film deposition. The a-IGZO film deposition with addition of H_2 gas were performed in order to control oxidation process during a-IGZO film formation via balance between oxidation-reduction. The results of optical emission spectrum indicate the possibility for the suppression of oxidation by oxygen atoms of a-IGZO films during deposition due to addition of H_2 gas. The characteristics of TFT fabricated with IGZO film via plasma-enhanced magnetron sputter deposition system have been investigated. The result exhibits that the possibility of expanding process window for control of balance between oxidization and reduction by addition of H_2 gas. The a-IGZO channel TFTs fabricated plasma-enhanced reactive sputtering system with addition of H_2 gas exhibited good performance of field-effect mobility 15.3 cm^2 (Vs)$^{-1}$ and subthreshold gate voltage swing (S) of 0.48 V decade^{-1}.

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