Different Characteristics of Zinc Tin Oxide Thin Film by the Effect of Fabricating Method; Mist-CVD and Spin Coating

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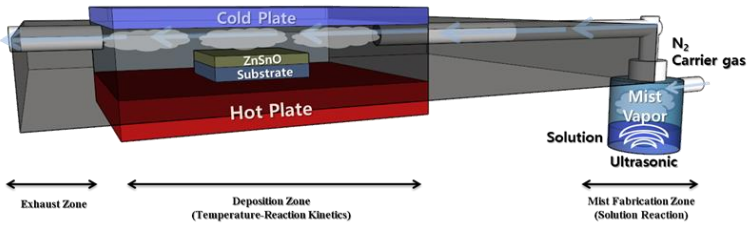
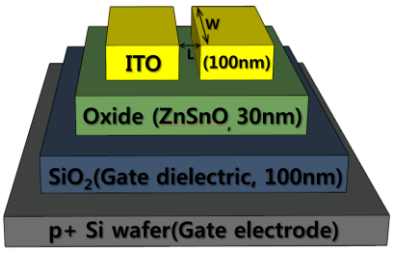
Mist-CVD (Mist chemical vapor deposition) and spin coating are employed to fabricate Zinc tin oxide thin films. Thin film analysis was taken to see the different characteristics depending on the methods. The solution for both Mist-CVD and spin-coating were made by tin chloride and zinc chloride (5:5) as solute and acetone and DI water as solvent. Zinc tin oxide thin film deposited by Mist-CVD and spin coating on silicon substrate above 350°C showed different crystallization. X-ray diffraction of Zinc tin oxide thin film using Mist-CVD showed polycrystalline, while spin-coating method showed amorphous phase. X-ray photoelectron spectroscopy was investigated to see the chemical composition of the thin film. While the solution had the same ratio of zinc and tin, zinc tin oxide thin film made by Mist-CVD had the abundance of Tin ratio. Thin film that was made by spin-coating showed the same ratio for zinc and tin.

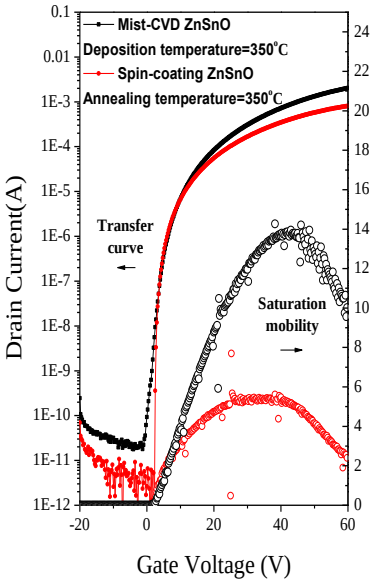
Thin film transistors (TFTs) were made to see the transfer characteristics of zinc tin oxide. Thin-film transistor made by mist-CVD at 350 °C showed a mobility of 14.61 $cm^2 V^{-1} s^{-1}$ in the saturation region, a subthreshold swing (SS) of 0.99 V/decade and a threshold gate voltage (Vth) of 3.24 V. On the other hand, thin-film transistor made by spin coating showed a low mobility at 350 °C compare to mist-CVD which had a mobility of 6.88 cm2 V−1 s−1 in the saturation region, a subthreshold swing (SS) of 0.47 V/decade and a threshold gate voltage (Vth) of 3.33 V.



(Figure.1)



(Figure.2)



(Figure.3)

Figure.1: Schematic illustration of Mist-CVD system

Figure.2: Schematic illustration of the fabricated ZnSnO TFT (W/L= 800 µm / 200 µm)

Figure.3: Transfer characteristics of Zinc Tin Oxide TFTs using Mist-CVD and Spin-Coating