Solution-processed Zinc Oxide Based Transparent Channel Layer for Thin Film Transistor

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We synthesized the stable solution for the deposition of the zinc tin oxide (ZTO) and indium zinc oxide (IZO) thin films by simple solution process. The ZTO and IZO solutions were prepared using zinc acetate dihydrate, tin(II) chloride and indium(III) acetate as the precursors and acetylacetone and diethanolamine as the chelating agents. The ZTO and IZO thin films were fabricated using spin-coating and annealed at 500°C under ambient condition. The films are amorphous and highly transparent (>90% transmittance) in visible region. Thin film transistors (TFTs) with ZTO and IZO channel layer and SiO$_2$ dielectric layer were operated in accumulation-mode and depletion-mode respectively. The ZTO and IZO TFTs have high field-effect mobilities, positive threshold voltages, low subthreshold slopes, and high on-to-off current ratios. The low-cost solution processed ZTO and IZO thin films are promising active layers for backplane TFTs of AMOLED.

Keywords: transparent oxide semiconductor, zinc oxide, thin film transistor, solution process