

Effects of 4MP Doping on the Performance and Environmental Stability of ALD Grown ZnO Thin Film Transistor

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Highly stable and high performance amorphous oxide semiconductor thin film transistors (TFTs) were fabricated using 4-mercaptophenol (4MP) doped ZnO by atomic layer deposition (ALD). The 4 MP concentration in ZnO films were varied from 1.7% to 5.6% by controlling Zn: 4MP pulses. The carrier concentrations in ZnO thin films were controlled from $1.017 \times 10^{20}/\text{cm}^3$ to $2.903 \times 10^{14}/\text{cm}^3$ with appropriate amount of 4MP doping. The 4.8% 4MP doped ZnO TFT revealed good device mobility performance of $8.4 \text{ cm}^2/\text{V}\cdot\text{s}$ and on/off current ratio of 10^6 . Such 4MP doped ZnO TFTs were stable under ambient conditions for 12 months without any apparent degradation in their electrical properties. Our result suggests that 4 MP doping can be useful technique to produce more reliable oxide semiconductor TFT.

Keywords: Atomic Layer deposition, 4-mercaptophenol, Thin film transistors