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UV-Assisted Atmospheric Pressure Spatial Atomic Layer Deposition of ZnO RAVI RANINGA, ROBERT HOYE, JUDITH DRISCOLL, Univ of Cambridge, DEVICE MATERIALS GROUP TEAM — ZnO has received much renewed interest as a wide band gap semiconductor for its variety of applications. For certain applications, such as thin film transistors, it is important to have highly crystalline ZnO with few defects, as a high defect concentration introduces too many charge carriers and can contribute to source-drain leakage. In this paper, we present a new roll-to-roll process, namely UV-Assisted Atmospheric Pressure Spatial Atomic Layer Deposition, for synthesizing high quality, crystalline ZnO. Using X-ray diffraction techniques, we show that the UV-activation of diethylzinc allows us to deposit c-axis oriented ZnO at temperatures as low as 50 C with significantly improved crystallinity. This temperature is significant as it is below the glass transition temperature of polyethylene terephthalate (PET), a popular substrate in the field of flexible electronics. Our new process allows us to overcome the tendency of ZnO to be amorphous when grown below 100 C. We also present the effect of growth under UV-illumination at different wavelengths on the defect states in ZnO with the use of X-ray photoemission spectroscopy, photothermal deflection spectroscopy and photoluminescence.

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