



Plasma Quest Limited

ZnO AND HfO₂ THIN FILMS DEPOSITED AT AMBIENT TEMPERATURE USING PLASMA QUEST'S HI TARGET UTILISATION SPUTTERING (HiTUS) PROCESS

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ZnO and HfO₂ thin films have been deposited at ambient temperature using Plasma Quest Limited's Hi Target Utilisation Sputtering (HiTUS) technology. These materials are useful for transparent thin film transistor applications. Within these device structures, HfO₂, with a high dielectric permittivity and breakdown voltage acts as a good gate dielectric. Resistive ZnO coatings ($> 10^{10} \Omega\text{cm}$) have been deposited over the HfO₂ layer to make up the device channel. The electrical properties of the ZnO coatings may be controlled by varying the oxygen partial pressure during the deposition process. With decreasing oxygen flow rate the conductivity of the ZnO is seen to increase. It has therefore been possible to deposit a conductive zinc oxide layer over the more resistive ZnO channel to reduce contact resistance at the source and drain electrodes.

The figure below shows the transmission of the two types of ZnO. The deposition rate for the conductive ZnO is 525 Å/min. This is reduced to approximately 330 Å/min for the resistive ZnO films which is characteristic of target hysteresis effects. The green and red transmission spectra in the figure below are from three separate trials. The run to run repeatability of these measurements demonstrates the stability of the HiTUS process. Excellent coating uniformity is also observed over an 8" wafer.

Transmission of Resistive and Conducting ZnO for use in Thin Film Transistors

