

ABSTRACT:

Next-Generation Solution Combustion Synthesis of Oxide Semiconductors for
M-3D Integration

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I will describe our recently developed solution combustion synthesis (SCS) for ultra-low-thermal-budget (<200°C) processing for BEOL-compatible transition metal oxide (TMO) semiconductors. TMO semiconductors particularly amorphous IGZO, In_2O_3 , ITO, IGO, IWO, HFO, and related transition-metal oxides are uniquely suited for monolithic M-3D integration in the post-Moore era. Their primary advantage is an inherently low thermal budget (<400°C, often <300°C for amorphous phases), enabling direct BEOL compatibility without damaging underlying Si-CMOS or lower-tier interconnects. We demonstrate that SCS yields high-quality, uniform TMO films ideally with controlled stoichiometry, low defect density, and excellent electrical performance directly on temperature-sensitive substrates or pre-fabricated interconnect tiers. We seek to accelerate the transition from current ALD-centric demonstrations to manufacturable, ultra-dense 3D prototypes while mitigating the processing, mobility, reliability, and stacking challenges that currently exist.