Low-Thermal-Budget BEOL-Compatible Beyond-Silicon Transistor Technologies for Future Monolithic-3D Compute and Memory Applications

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If Silicon material system for massive monolithic-3D (M3D) integrated circuits is difficult, are there solutions that are beyond Si? In this talk, we discuss two low-thermal-budget approaches: Oxide Semiconductor and 2D Materials for M3D integration. By reviewing some of our recent work with IGZO-based transistors and memories, followed by our investigation of the 2D material opportunities for 3D memories, we highlight the need for new low-thermal-budget additive techniques for heterogenous multi-material integration as well as low-temperature material modification. Given the unlikelihood of "perfect materials", new system architecture-material-device co-design intervention will be essential to capitalize on the specific trade-offs of the components.