Nov 13, 2025

Time: 2:30 - 4:00 PM
Location: CBB 104

Ferroelectric Thin Films for Three Dimensional Non-volatile Memory

Susan Trolier-McKinstry

Steward S. Flaschen Professor of Ceramic Science and Engineering, and Professor of Electrical Engineering.

Evan Pugh University

ABSTRACT:

This talk will discuss new families of ferroelectric materials available for integration with CMOS electronics. These new materials, including Hf1-xZrxO2, Al1-xScxN, Al1-xBxN and Zn1-xMgxO, offer the possibility of enabling 3D non-von Neumann computer architectures exploiting ferroelectrics for local memory, logic in memory, digital/analog computation, and neuromorphic functionality. This approach circumvents the end of Moore's law in 2D scaling, while simultaneously overcoming the "von Neumann bottleneck" in moving instructions and data between separate logic and memory circuits. Computing accounts for 5 – 15% of worldwide energy consumption. While recent efficiency gains in hardware have partially mitigated the rising energy consumption of computing, major gains are achievable in a paradigm shift to 3D computing systems, especially those that closely couple memory and logic. The materials science of the deposition, ferroelectric wake-up, switching, and reliability science will be covered.

BIOGRAPHY:

Susan Trolier-McKinstry is an Evan Pugh University Professor and Steward S. Flaschen Professor of Ceramic Science and Engineering, and Professor of Electrical Engineering. Her main research interests include thin films for dielectric and piezoelectric applications. She directs both the Center for Dielectrics and Piezoelectrics and the Center for Three-Dimensional Ferroelectric Microelectronics. She is a member of the National Academy of Engineering, a fellow of the American Ceramic Society, IEEE, and the Materials Research Society, and an academician of the World Academy of Ceramics. She currently serves as an associate editor for Applied Physics Letters. She was 2017 President of the Materials Research Society; previously she served as president of the IEEE Ultrasonics, Ferroelectrics and Frequency Control Society, as well as Keramos.