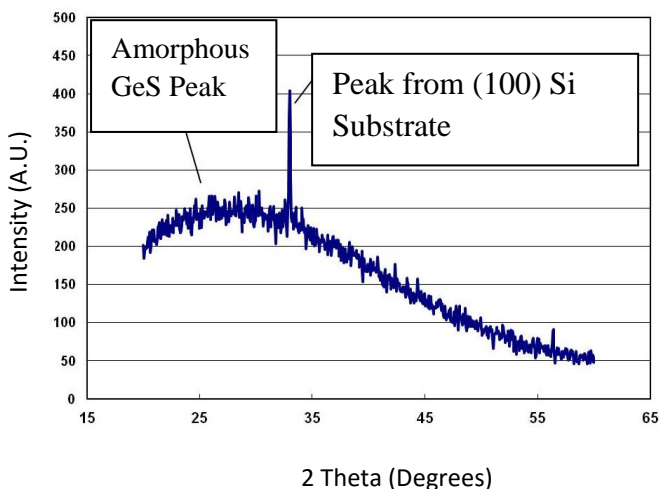
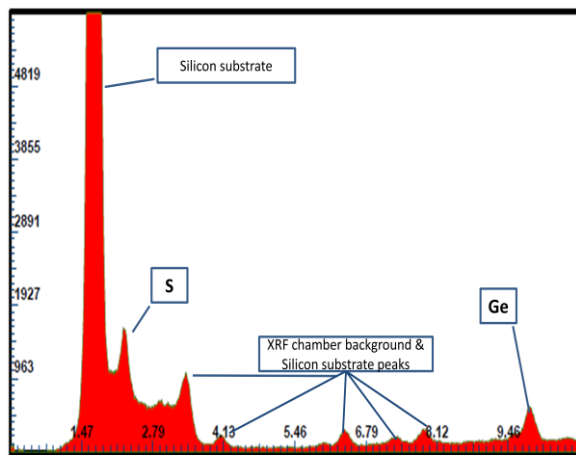
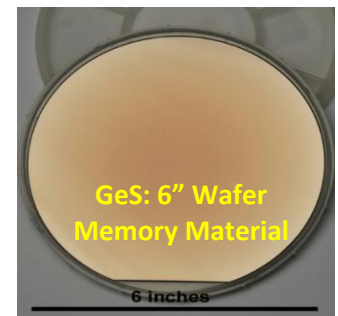
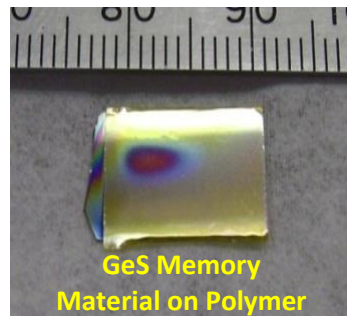
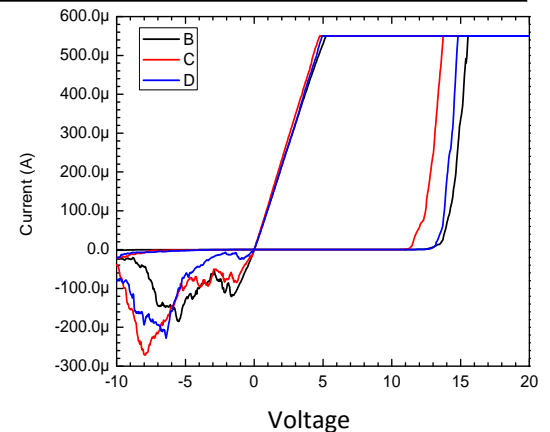


Product Description: Metal ions can, in some cases, be effectively dissolved in chalcogenide glasses, essentially forming a solid electrolyte. Further, by controlling the amount and distribution of the metal ions, one can control the conductivity of the chalcogenide - in fact it can reversibly be made highly insulating or very conductive - changing the resistivity by a few to several orders of magnitude. An example is Ag in GeS or CuS; whereat a few tens of atomic percent of Ag, dispersed in the chalcogenide can be voltage driven to collect at one electrode or to form a highly conductive chain (a conducting bridge) through the film. The resistive or conductive states can be read under state preserving conditions and thereby form the core of a chemical bridge random access memory (CBRAM) or as is sometimes referred to as a programmable metallization cell (PMC). This structure, whose properties in part depend on the amount of current driven through it has also been considered a memristor. SMI offers MOCVD deposition services for GeS (or CuS) films on substrates at 2" through 8" diameters (or other shapes). GeS films (post deposition), doped with Ag, have a conductivity that may be reversibly varied by several orders of magnitude by applying a voltage. These films are of interest for advanced and other devices benefitting from a tunable resistance such as filters. Films are deposited at low temperatures; < 300 C and are hence compatible with custom flexible polymers. Films have been grown on Si, sapphire, quartz, and polymer substrates, among others. Deposition can be carried out on multiple 2", 3" and 4" wafers as well as single 6" or 8" wafers. SMI's MOCVD approach is especially useful to the researcher as it allows the researcher to rapidly vary compositions and process parameters for film optimization for a given application. Doped and alloyed films are by special order. Ag is added by photo enhanced diffusion.

GeS Film Grown on (100) Si at 300 °C



**GeS: Ag
Simple
Memory Test
Cell
(Read/Write)
Hysteresis**



GeS Film Grown on (100) Si at 300 °C

Product Specifications:

Base Material: GeS (CuS and alloys or doped films may also be provided)

Resistance: Unconnected - Highly Resistive
Contiguous – Low Resistance

Adherence: High (Tape Test)

Thickness: 10-1000 nm (typically); 2" wafer ±5%

Substrate type: Si, Quartz, Al₂O₃, Polymer, others;

Substrate Dimensions: Multiple 2", 3", 4" wafers or Single 6" or 8" wafers; Larger diameters are possible
Polymer – sheets or tapes also possible