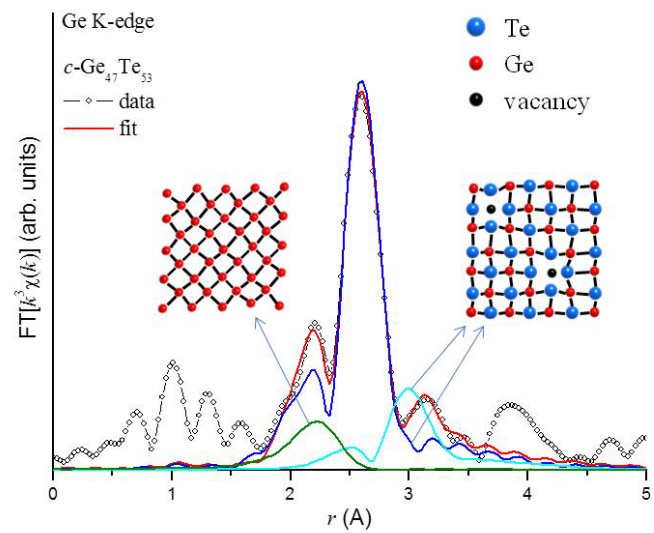
Atomic Arrangements in Germanium Telluride Influence Phase Change Memory

- Phase change memory (PCM) stores information using a special glass that can morph between crystalline and amorphous states. PCM is one of the newest memory technologies under development. Like flash memory, PCM retains stored information even when not powered. But PCM is faster.
- An international collaboration of scientists has investigated the structural basis of phase-change speed using germanium telluride as the model system. They determined the local atomic arrangements of each constituent element before and after the phase-change event. Their results indicate how the phase-switching speed and crystallization temperature strongly depend on the composition.
- Using EXAFS at NSLS beamline X18B, the team characterized thermally deposited germanium-telluride films, systematically covering a much wider range of Ge-Te formulations than previously attempted. The comprehensive, quantitative structural information has given deeper insight of the phase-change process.
- These findings will help fine-tune the compositional window and the film-processing conditions for improved PCM performance in more demanding applications.



Ge K-edge (innermost electron shell) EXAFS analysis of crystallized $Ge_{47}Te_{53}$ film, which shows presence of Ge quasi-crystals and GeTe crystals with non-negligible amount of Ge-site vacancies

Y.G. Choi et al., "Role of local structure in the phase change of Ge-Te films," Chemical Physics Letters, 534 (2012) 58-61