Synchrotron X-ray Studies of Thin Films and Structures for IBM R&D

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For over 30 years IBM Research scientists and their collaborators have used of a variety of synchrotron x-ray techniques to understand the behavior of materials and processes that impact microelectronics technologies. Most of this work made use of the X20 beamlines at the NSLS, and it will continue at several venues in the future. Three of the techniques we use most often to characterize thin polycrystalline or epitaxial films and structures are high-resolution XRD for phase identification and strain, pole figures for texture, and time-resolved XRD during rapid thermal annealing for phase formation sequences and kinetics. Examples will be given to illustrate high-impact results in three technologies: stress in metallization, ferroelectric switching in strained epitaxial perovskites, and alloying of nickel silicide to extend contacts out to 22 nm. The silicide work was awarded an IBM Research Outstanding Technical Achievement Award for 2014.