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Large area radiation detectors based on II VI thin films

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The development of low temperature device technologies that have enabled flexible displays also present opportunities for flexible electronics and flexible integrated systems. Of particular interest are possible applications in flexible, low metal content, sensor systems for unattended ground sensors, smart medical bandages, electronic ID tags for geo-location, conformal antennas, neutron/gamma-ray/x-ray detectors, etc. In this talk, our efforts to develop novel CMOS integration schemes, circuits, memory, sensors as well as novel contacts, dielectrics and semiconductors for flexible electronics are presented. In particular, in this presentation we discuss fundamental materials properties including crystalline structure, interfacial reactions, doping, etc. defining performance and reliability of II-VI-based radiation sensors. We investigate the optimal thickness of a semiconductor diode for thin-film solid state thermal neutron detectors. Besides II-VI materials, we also evaluated several diode materials, Si, CdTe,GaAs, C (diamond), and ZnO, and two neutron converter materials,10B and 6LiF. We determine the minimum semiconductor thickness needed to achieve maximum neutron detection efficiency. By keeping the semiconductor thickness to a minimum, gamma rejection is kept as high as possible. In this way, we optimize detector performance for different thin-film semiconductor materials.