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Colossal Magneto Resistive (CMR) Bolometric Sensors as a Total Energy Monitor for the Linac Coherent Light Source (LCLS) Free Electron Laser (FEL) G. YONG, R. KOLAGANI, R. MUNDLE, A. DAVIDSON, Towson U., Y. LIANG, Motorola Lab, O. DRURY, E. ABLES, S. FRIEDRICH, LLNL — We are developing a CMR based bolometric x-ray detector as a total energy monitor for the LCLS FEL to be built at the Stanford Linear Accelerator Center. The FEL will produce ∼200 femtosecond pulses in the energy range 0.8 to 8 keV with 10^{12} photons per pulse. The bolometer is designed to measure the total energy of each laser pulse with repeatability below 1% and an absolute accuracy below 10%. The detector is fabricated using epitaxial thin films of $Nd_{0.67}Sr_{0.33}MnO_3$ grown on Si by Pulsed Laser Deposition. An epitaxial buffer layer of $SrTiO_3$ is used as a chemical barrier and an additional template layer of $Bi_4Ti_3O_{12}$ is employed to facilitate lattice match with the $Nd_{0.67}Sr_{0.33}MnO_3$ layer. We have been able to obtain good quality epitaxial thin films by this approach. Prototype detectors have been fabricated photolithographically, and are operated in a pulse tube refrigerator at temperatures between 100 to 150 K. Initial tests with a thermal heater pulse show that the film properties are sufficient for detector functionality. We will discuss the details of material optimization, characteristics of the sensor material such as the temperature coefficient of resistance and 1/f noise, and projections of the detector response under photon illumination.

G. Yong
Towson U.

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