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Integration of Multifunctional Epitaxial Oxide Heterostructures with Si(001) SRINIVASA RAO SINGAMANENI, JOHN PRATER, JAY NARAYAN, North Carolina State University — Multifunctional heterostructures exhibit a wide range of functional properties, including colossal magneto-resistance, multiferroic behavior, and spin, charge, and orbital ordering. However, putting this functionality to work remains a challenge. To date, most of the previous works reported in the literature have dealt with heterostructures deposited on closely lattice matched (using lattice matching epitaxy-LME) insulating substrates such as $DyScO_3$, $NdGaO_3$, MgO, $SrTiO_3$ and MBE-grown STO buffered Si(100). This presentation discusses the major advances in the integration of multifunctional oxide materials onto ubiquitous silicon semiconductor platform reported[1−6] in the recent past by the presenting authors using a novel thin film growth approach, called 'domain matching epitaxy'(DME), which minimizes the strain and nucleation of unwanted defects. The DME paradigm has been used across the large misfit scale (7-25%). Of particular interest, thin film heterostructures including two-phase multiferroics such as $BiFeO_3$(BFO)/$La_{0.7}Sr_{0.3}MnO_3$ (LSMO), $BaTiO_3$(BTO)/LSMO, and LSMO/$SrRuO_3$(SRO). These significant materials advancements may herald a flurry of exciting new advances in CMOS-compatible multifunctional devices.[1]**S. S. Rao,** *et al.***,** Nano Letters **13**, 5814 (2013); J. Appl. Phys., **116**, 094103 (2014); J. Appl. Phys., **116**, 224104 (2014); J. Appl. Phys., **117**, 17D908 (2015); [5]J. Appl. Phys., **117**, 17B711 (2015); [6]Current Opinion in Solid State and Materials Science. **19,** 301-304 (2015).

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