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Magnetic Oxide Superlattices[1]

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Atomically regulated interfaces and superlattices composed of oxides are very interesting research arena for physics and possible applications. By selecting magnetic oxides as one of the components, one can study basic phenomena of spin polarized electrons at the interfaces [1]. Also, one can realized ?multiferroics? at the interface because magnetization and electric dipole due to interface charge imbalance can coexist. We demonstrated that non-linear Kerr effect [2] can be a tool of detecting interface magnetism in ?tricolor superlattices? composed of asymmetric A-B-C-A-B-C- sequence with A, B, and C being component oxides [3]. This technique was successfully applied to detect, design and enhance interface magnetism in a single heterointerface [4]. We now extend the artificially built-in multiferroic superlattices to other sequences, which include DNA superlattices (D: donor, N: neutral, and A: acceptor) and Ratchet superlattices (asymmetric doping profile). We also demonstrate realization of interface ferromagnetism at pn junctions made of two Mott insulators and tuning the magnitude through the channels of orbital and charge degrees of freedom.

[1] M. Izumi et. al., J. Phys. Soc. Jpn., 71, 2621 (2002), Phys. Rev. B 64, 064429 (2001).
[2] Y. Ogawa, et. al., Phys. Rev. Lett., 90. 217403 (2003).
[3] H. Yamada, at. al., Appl. Phys. Lett., 80, 622 (2002).
[4] H. Yamada, et. al., Science, 305, 646 (2004).

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