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Ferromagnetism in cobalt-doped SrTiO3 on Si grown by molecular beam epitaxy AGHAM POSADAS, CHANDRIMA MITRA, ALEXANDER DEMKOV, University of Texas at Austin — We report the epitaxial growth of ferromagnetic cobalt-doped $SrTiO_3$ directly on silicon without the use of any buffer by molecular beam epitaxy (MBE). Magnetization as a function of magnetic field was performed for samples with varying doping concentration at room temperature and at 10 K. Room-temperature ferromagnetism is confirmed in single phase samples with composition 20-30% cobalt. We also performed x-ray photoelectron spectroscopy of the Co and Ti 2p levels to determine stoichiometry and cobalt oxidation state. In order to elucidate the origin of ferromagnetism, we also performed first-principles calculations of cobalt-doped $SrTiO_3$ with different doping concentrations and dopant configurations. The calculations show that intrinsic ferromagnetism can be stabilized beyond a critical concentration in $SrTiO_3$ under particular conditions. The ability to directly integrate a ferromagnet on silicon in epitaxial form may potentially overcome the problems of impedance mismatch and interface losses in applications involving spin injection in silicon.

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