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Enhanced Interfacial Ferromagnetism in (111)-Oriented $LaNiO_3/CaMnO_3$ Superlattices CHARLES FLINT, Department of Materials Science and Engineering, Stanford University, YURI SUZUKI, Department of Applied Physics, Stanford University — Interfacial ferromagnetism (i-FM) in complex oxides is a promising route for generating magnetic phenomena. An interesting example is FM in $CaMnO_3$ (CMO)-based superlattices (SLs), which is attributed to Mn-Mn double exchange (DE). In $(LaNiO_3)_N/(CaMnO_3)_M$ (LNO/CMO) SLs on (001)-oriented $LaAlO_3$, i-FM arises from Mn-Mn DE and Ni-Mn superexchange (SE). The relative contribution from these mechanisms can be tuned via cooperative distortions of the oxygen octahedra. For CMO, a G-type antiferromagnet, (001) planes are fully spin compensated, while (111) planes are fully uncompensated. Therefore, one may expect (111)-oriented SLs to have enhanced interfacial coupling, giving us insight into the interplay between the magnetic mechanisms in these SLs. We have fabricated LNO/CMO SLs on (111)-oriented $LaAlO_3$. We observe a significant enhancement in i-FM compared to (001)-oriented LNO/CMO SLs. Magnetometry measurements show that a (111)-oriented N=4, M=4 SL has more than a threefold enhancement in i-FM compared to the (001)-oriented N=4, M=4 SL with 1.0 B/int. Mn for (111) and 0.3 B/int. Mn for (001) SLs. These results are consistent with enhanced Ni-Mn SE arising from increased interfacial Ni-Mn bonding as a result of the (111) growth axis.

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