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Tunable Charge and Spin Order in PrNiO3 Thin Films and Superlattices MATTHIAS HEPTING, MATTEO MINOLA, ALEX FRANO, GEORG CRISTIANI, MENG WU, MARTIN BLUSCHKE, YI LU, HANS-ULRICH HABERMEIER, GENNADY LOGVENOV, EVA BENCKISER, MATHIEU LE TACON, BERNHARD KEIMER, MPI FKF Stuttgart — The rich phase diagram of transition metal oxides such as rare-earth nickelates $R\mathrm{NiO}_3$ (R = rare-earth) results from the interplay between charge, orbital, spin, and lattice degrees of freedom. Recent progresses in the growth of epitaxial heterostructures have allowed the design of new phases, distinct from the ones existing in bulk materials. We have used polarized Raman scattering in conjunction with resonant soft x-ray diffraction to probe charge and magnetic ordering in epitaxially strained PrNiO_3 films, and in superlattices (SLs) of PrNiO_3 with the insulator PrAlO_3. As a function of epitaxial strain and spatial confinement we have identified three different states, only two of which were observed before in bulk $R\mathrm{NiO}_3$: an insulating state with robust spin and charge order in films and SLs under tensile strain, and a metallic state with neither form of order in films under compressive strain; the SLs under compressive strain however exhibit a weakly metallic state with fully developed spin order and without presence of charge order. This novel pure spin-density wave ground state has been predicted by theory but experimental evidence remained elusive so far.

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