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Mimicking cuprates: large orbital polarization in square-planar nickelates.[1] JUNJIE ZHANG, A.S. BOTANA, JOHN W. FREELAND, D. PHELAN, HONG ZHENG, Argonne Natl Lab, V. PARDO, Universidade de Santiago de Compostela, M. R. NORMAN, JOHN MITCHELL, Argonne Natl Lab — High temperature cuprate superconductivity remains a defining problem in condensed matter physics. Among myriad approaches to addressing this problem has been the study of alternative transition metal oxides with similar structures and 3d electron count that are suggested as proxies for cuprate physics. Here, we report one such alternative: the low-valent, quasi-two-dimensional trilayer nickelates, R4Ni3O8 (R=La and Pr). By combining x-ray absorption spectroscopy and density functional theory calculations, we find that these compounds exhibit a low-spin configuration and significant orbital polarization of the occupied eg states with pronounced dx2-y2 character near the Fermi energy. Notably, a charge-ordered stripe phase, previously reported for La4Ni3O8, collapses in favor of a metallic ground state when substituting La with Pr, offering entrée to a region of 3d electron count important to hole-doped high-Tc cuprates but in the absence of quenched disorder.

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