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Highly Aligned Epitaxial Nanorods with a Checkerboard Pattern in Oxide Films S. PARK, Y. HORIBE, T. ASADA, N. LEE, S-W. CHEONG, Rutgers Center for Emergent Materials, Rutgers University, Piscataway, New Jersey 08854, L.S. WIELUNSKI, T. GUSTAFSSON, Department of Physics & Astronomy, Rutgers University, Piscataway, New Jersey 08854, P.L. BONANNO, S.M. O'MALLEY, A.A. SIRENKO, Department of Physics, New Jersey Institute of Technology, Newark, New Jersey 07102, A. KAZIMIROV, Cornell High Energy Synchrotron Source (CHESS), Cornell University, Ithaca, New York 14853, T. TANIMURA, Research Department, NISSAN ARC, LTD., Yokosuka, Kanagawa 237-0061, Japan — One of the central challenges of nano-science is fabrication of nanoscale structures with well-controlled architectures using planar thin-film technology. Herein, we report our discovery of a periodic nanometer-scale self-assembly in spinel films, fabricated by manipulating spontaneous phase separation and substrate strain. The films consist of two types of chemically-distinct nanorods with mutually coherent interfaces, perfectly aligned along the film growth direction. This unique three dimensional epitaxy process contrasts with a typical behavior in conventional growth of highly lattice-mismatched films, and thus provides an important route for film fabrication of nano-structured arrays with periodically varied electronic and magnetic properties.

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