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Low-energy Electron Microscopy (LEEM) Imaging and Diffraction of $Ho_{1-x}Y_xMnO_3$(0001) M.D. ULRICH, ARO and NCSU, RELJA VASIC, NCSU, J.T. SADOWSKI, Center for Functional Nanomaterials, BNL, J.E. (JACK) ROWE, NCSU, H.D. ZHOU, C.R. WIEBE, National Magnetic Field Lab, FSU — We have investigated the (0001) surfaces of several hexagonal perovskite alloys $Ho_{1-x}Y_xMnO_3$ (x=0-1), by low-energy electron microscopy (LEEM) using both mirror-mode imaging and diffraction (LEED) techniques. We find LEEM structured domains for our (0001) surfaces of single crystals grown by a traveling-solvent-floating zone technique which are likely due to work function variations on a scale of $\sim$100 nm to 5 μm. The domains are visible up from 500 $^\circ$C to $\sim$900 $^\circ$C, giving possible evidence for the expected 180 $^\circ$ ferroelectric domain structure below and above the Curie temperature of $\sim$630 $^\circ$C. The domain contrast in LEEM was lower upon cooling and we are exploring several mechanisms for this result. In addition, we observed LEED patterns from $\sim$24 to 1100 $^\circ$C, with electron energies in the range of 15eV to 50eV. Above 500 $^\circ$C, 1$\times$1 and 2$\times$2 patterns were obtained for all samples with the sharpest LEED contrast near T $\sim$1000 $^\circ$C. In some cases a 2$\times$4 surface reconstruction was also evident but with less consistent order. The 2-D lattice constant parameters in (0001) plane are consistent with previous literature values for pure $YMnO_3$ (see: Aberdam *et al., Surface Science* **14,** pp.121-140 (1969)).

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