Three Dimensional, Single-crystal, Oxide NANOFENCES for Epitaxial Growth of Electronic, Magnetic or Electromagnetic Nanoscale-Devices

AMIT GOYAL, SUNG-HUN WEE, KARREN MORE, ELIOT SPECHT, ORNL — A unique, three-dimensional (3D), single-crystal, MgO, NANOFENCE comprised of single crystal MgO nanowire units was synthesized via epitaxial growth on (100) SrTiO3 substrates. Individual single crystal MgO nanowire units comprising the nanofence were observed to have high aspect ratios with small diameters of 10-20 nm and long lengths from 100 nm up to 1 µm. X-ray diffraction shows that the 3D MgO nanofence has an epitaxial relation with (100) SrTiO3 substrates with only a single \{100\}<100> orientation and with full-width-half-maximum values of (200) \(\omega\)-scan and (110) \(\phi\)-scan with 4.5o and 5.5o, respectively. Such nanofences offer a single crystal, 3D nanotemplate for epitaxial growth of wide-ranging, 3D, electronic, magnetic and electromagnetic nanodevices.

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