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Multilayer Structures in MgB2 superconducting thin films: influence on doping, pinning, and connectivity[1] MIKE SUMPTION, MIKE SUSNER, SCOT BOHNENSTIEHL, TED COLLINGS, Materials Science Dept, The Ohio State University — Pinning force density, connectivity, and doping were investigated for MgB_2 superconducting thin films. Pulsed Laser Deposition (PLD) was used to produce MgB_2 thin films on Al_2O_3 (0001), MgO (111), YSZ (111), and SiC (0001) substrates. The MgB_2 target was manufactured through high pressure and high temperature induction heating that produced a highly dense material. ZrB_2, SiC, or C targets were alternated with the MgB_2 target to produce films with various levels of doping and/or pinning centers. X-ray diffraction (XRD) was used to determine the substitution, strain, and epitaxy. Surface microstructures and grain sizes were compared via scanning electron microscopy (SEM). Transmission electron microscopy (TEM) was employed on ion-milled samples representing cross-sections of the film to determine the oxide content of the films as well as to confirm if the added dopants modified the superconducting properties of the MgB_2 via atomic substitution or increases in strain. Normal-state resistivity measurements were taken on the films to determine the connectivity as compared to literature single crystal values. Magnetic J_cs were taken of the films to determine the influence of the microstructure on the pinning properties.

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