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Growth and properties of WO₃, Na_xWO₃, and K_xWO₃ thin films. AKIO TSUKADA, SEUNG SAE HONG, ROBERT HAMMOND, THEODORE GEBALLE, MALCOLM BEASLEY, Geballe Laboratory for Advanced Materials, Stanford University — We report optimization of thin-film growth conditions and films properties of WO₃, Na_xWO₃, and K_xWO₃. Films are grown by pulse laser deposition and used substrates are (100) LaAlO₃ (a ~ 3.788 Å) and (111) Y-ZrO₂ (3.63 Å). Growth temperature and oxygen pressure are varied from 600C to 300C and from 10 mTorr to 1000 mTorr, respectively. WO₃ are formed in monoclinic or tetragonal structure on LaAlO₃ substrates. Films are insulators and temperature dependence of resistivity shows the variable range hopping with Coulomb interaction like behavior [resistivity is proportional to $\exp(1/T)^{1/2}$]. On Y-ZrO₂ substrates, WO₃ are formed in mixed structure of hexagonal and tetragonal due to an epitaxial effect [(111) Y-ZrO₂ substrate has hexagonal surface]. K_xWO₃ are formed in hexagonal structure on both substrates. a- and c-axis oriented films are obtained on LaAlO₃ and Y-ZrO₂ substrates, respectively. K_xWO₃ films show superconductivity at T_c(onset) ~ 4 K and T_c(zero) ~ 2 K. This work is supported by Air Force Office of Scientific Research.

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