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Tungsten as a substitutional dopant and its effect on ultrafast switching of vanadium dioxide JOYEETA NAG, KANNATASSEN APPAVOO, Vanderbilt University, WEIDONG LUO, Lawrence Berkeley National Laboratory and Oak Ridge National Laboratory, GERD DUSCHER, Univeristy of Tennessee, Knoxville and Oak Ridge National Laboratory, SOKRATES PANTELIDES, Vanderbilt University and Oak Ridge National Laboratory, RICHARD HAGLUND, Vanderbilt University — VO_2 undergoes a metal-insulator transition (MIT) at 340K accompanied by a structural change from monoclinic (M1) to tetragonal (R). We have grown W-doped VO_2 films on glass and epitaxially on sapphire substrates and have characterized them by SEM, white light transmission, RBS, XRD, and Z-STEM. These provide direct experimental evidence that W acts as a substitutional dopant in the VO_2 lattice in addition to lowering the transition temperature. From GGA+U, DFT-based simulations we have also calculated the formation energy of substitutional W in VO_2, and relative stability of M1 and R phases before and after doping. Ultrafast pump-probe measurements at 800nm with varying pump fluences show that doped VO_2 switches at substantially lower fluences than undoped VO_2, indicating that the W dopant provides additional conduction-band electrons, thus altering the photo-induced dynamics of the phase transition.

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