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Tungsten-doped vanadium dioxide thin films for THz analog optical applications[1] GULTEN KARAOGLAN-BEBEK, NADIM HOQUE, Texas Tech University, MARK HOLTZ, Texas State University, ZHAOYANG FAN, AYRTON BERNUSSI, Texas Tech University — The Mott transition of vanadium dioxide (VO2) has been widely studied, with abrupt changes in electrical and optical properties at temperature approximately 70 C. The phase transition properties of thin vanadium dioxide films can be changed by doping with tungsten making it a prospective candidate to realize tunable optical devices at terahertz (THz) frequencies. Tungsten incorporation into the vanadium dioxide film yields a wider transition window and a lower transition temperature allowing practical use in analog-like continuous applications. Our results reveal characteristic metal-insulator phase temperature and width of 40 C and 35 C, respectively, for the film with the highest W content. We show that the refractive index of W-doped vanadium dioxide can be continuously tuned and this provides precise control of the transmission properties of the vanadium dioxide films and discuss future active THz optical devices for analog applications. We demonstrate that W-doped vanadium dioxide films can be also used as anti-reflective coating at THz frequencies but at temperatures much lower than that observed for undoped films.

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