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Fabricating Stoichiometric Vanadium Dioxide Thin Films for Modulating Light Emission SHAO RAN HUANG, RASHID ZIA, Brown University — The near-room-temperature insulator-to-metal phase transition in vanadium dioxide (VO_2) can produce drastic changes in resistivity and optical constants. In the nanophotonics field, this property of VO_2 is particularly attractive, because it can be used to manipulate the local environment of light emitters. However, since vanadium exhibits a large number of stable oxides, it can be challenging to obtain stoichiometric VO_2. Although the published literature contains many reports of optimal fabrication conditions, such parameters can vary substantially from system to system due to differences in architecture. Here, we will present an experimental procedure for optimizing stoichiometric VO_2 thin film growth by sputtering. Temperature-dependent spectroscopic ellipsometry, x-ray-diffraction, and resistivity measurements have been used to characterize sputtered VO_2 thin films. The time-domain switching behavior of VO_2 has also been also investigated by pump-probe spectroscopy. Finally, building on the work of Cueff et al., we will show how these VO_2 thin films can be electrically switched to modulate light emission by erbium ions faster than their excited state lifetime.

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