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Nonreciprocal switching of VO_2 thin films on microstructured surfaces[1] CHARLES ADAMS, Vanderbilt Univ., ISMAIL KARAKURT, Isik Univ., PAUL LEIDERER, JOHANNES BONEBERG, Konstanz Univ., RICHARD HAGLUND, Vanderbilt Univ. — Vanadium dioxide is a strongly correlated electron material that undergoes an insulator-to-metal transition at approximately 340 K, with a corresponding large change in its optical and electronic properties. By depositing a VO_2 thin film on a planar hexagonal close-packed array of 1.54 μm diameter silica microspheres, we constructed a laser-triggered thin film optical switch that exhibits different fluence thresholds for the insulator-metal transition (IMT) depending on the direction of illumination. The IMT was triggered by a ns Nd:YAG laser (532 nm) from two directions normal to the substrate while monitoring the transmission with a near-IR diode laser. Due to the focusing effects of the microspheres, the fluence required for switching the VO_2 was 2.4 times higher when the switching laser was incident from the film (top) side of the array than from the microsphere (bottom) side. Through both the experiments and simulations, we find evidence for strong nonlinear near-field absorption in the VO_2.

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