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Light polarization control by reflection off an ultrathin, phase change layer

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We theoretically investigate and experimentally demonstrate polarization modulation of a beam of light interacting with a nanometer-thin layer of vanadium dioxide (VO2), a phase change material. As the material undergoes a phase transition from insulator to metal, large variations in refractive indices impart unequal phase shifts on s- and p-components of the electric field of light, thereby altering the polarization state in reflection. This control over polarization is achieved over a wide spectrum, ranging from 400 nm to above 2000 nm, on time scales of seconds to picoseconds by thermal or optical activation of VO2, and over propagation lengths of 25 nm, much shorter than in devices based on electro-optics and liquid crystals.

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