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Photoinduced phase transition in vanadium dioxide: visualizing the time-dependent crystal potential using ultrafast electron diffraction data

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Vanadium dioxide is notable for exhibiting several low-temperature insulating phases and having a very well studied insulator-metal transition at ˜68$^{\circ}C$ that is associated with a crystallographic change from monoclinic semiconductor to rutile metal. Using a combination of ultrafast electron diffraction (UED) and broadband spectroscopy, we have recently demonstrated that photoexcitation of monoclinic vanadium dioxide crystals below a threshold fluence induces a transition to a metastable state with monoclinic crystallography, but metal-like optical/electronic properties. This long-lived metallic phase appears to have no equilibrium analog. A detailed structural characterization of this phase, using a 3D visualization of electron scattering potential, is the subject of this poster. This visualization techniques confirms previous suspicions and offers more dynamical information than radial pair-correlation functions.

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