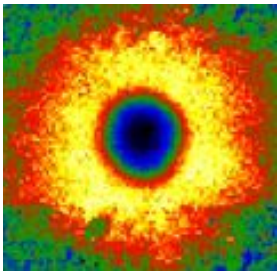

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Modeling Electron Energy-loss Spectra Of Thermally Tunable Vanadium Dioxide Nanostructures

Vanadium dioxide (VO2) is a material that exhibits an insulator-to-metal transition, which is accompanied by an abrupt change in its optical properties. The VO2 nanostructures can thus support both dielectric (Mie-type) and plasmonic resonances in the same spectral range, which can be switched by applied temperature. Furthermore, the optical response of the nanostructures can be tuned by engineering their dimensions and shape. The resonant modes can be characterized by standard far-field spectroscopic methods, but for a detailed characterization, we need a method that can access the optical near field. Electron energy-loss spectroscopy (EELS) in a transmission electron microscope utilizing a focused electron beam represents a technique suitable for probing optical near fields. Here, we demonstrate through numerical simulations that EELS could be an excellent technique for understanding the thermally switchable dielectric or plasmonic modes in VO2 nanostructures.

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