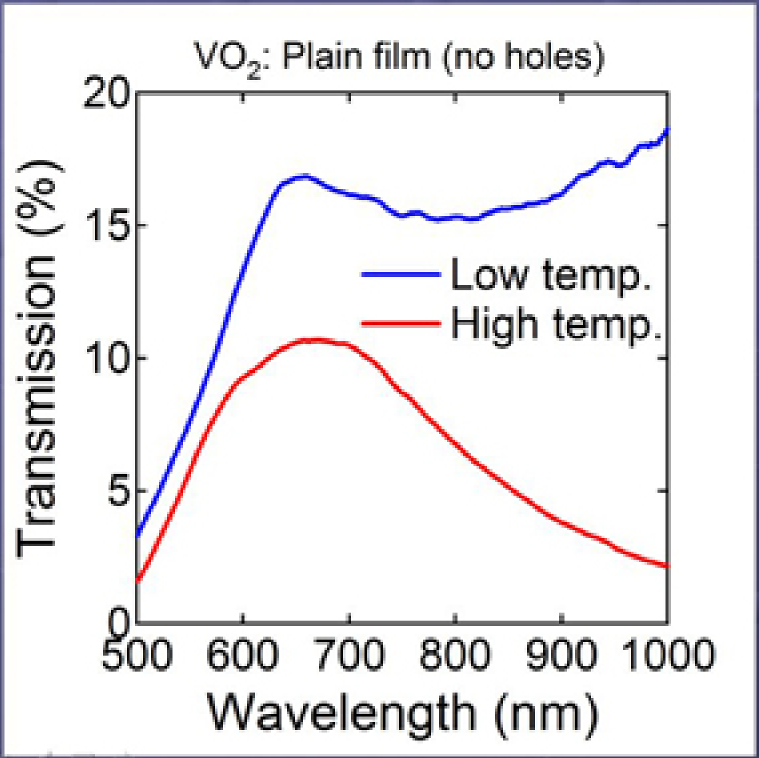
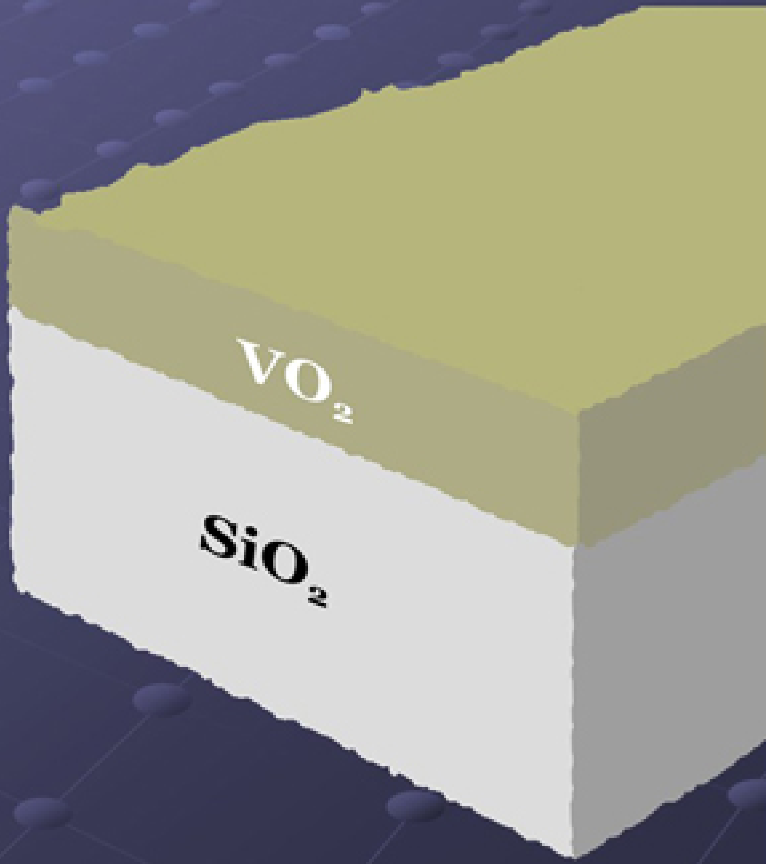
Transmission through **Plain** VO_2 Films

- Near-infrared wavelengths → metallic phase (high temperature) **less** transparent than insulating phase (low temperature).





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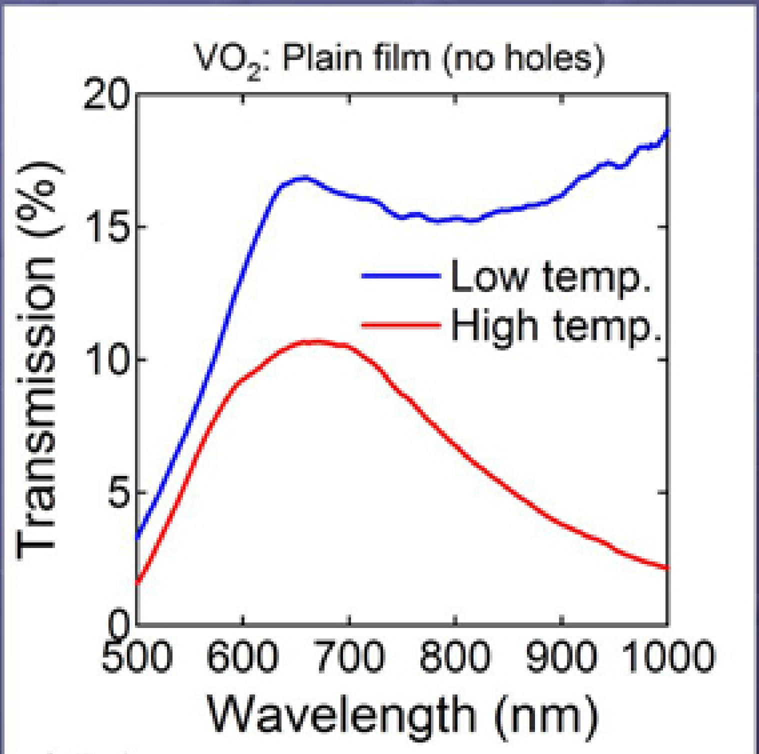
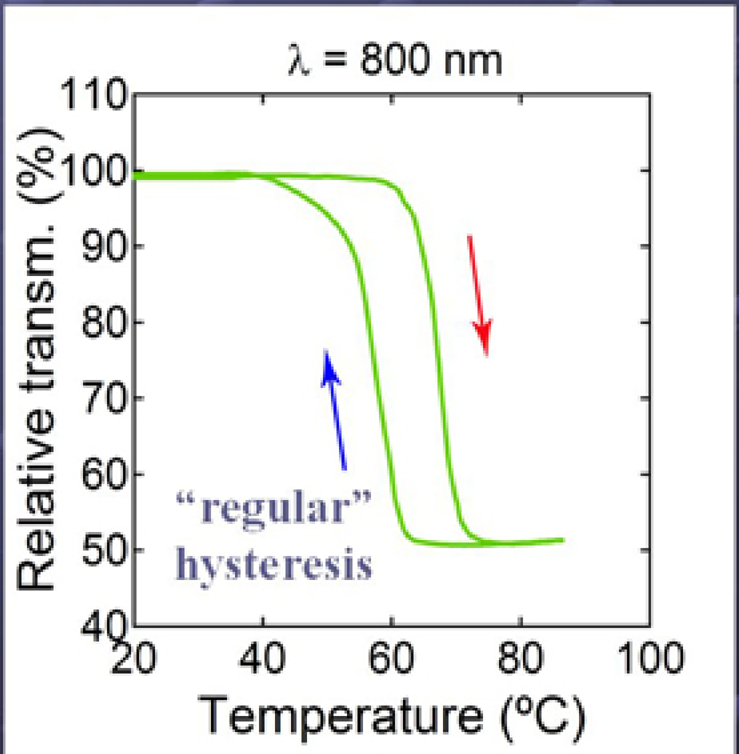


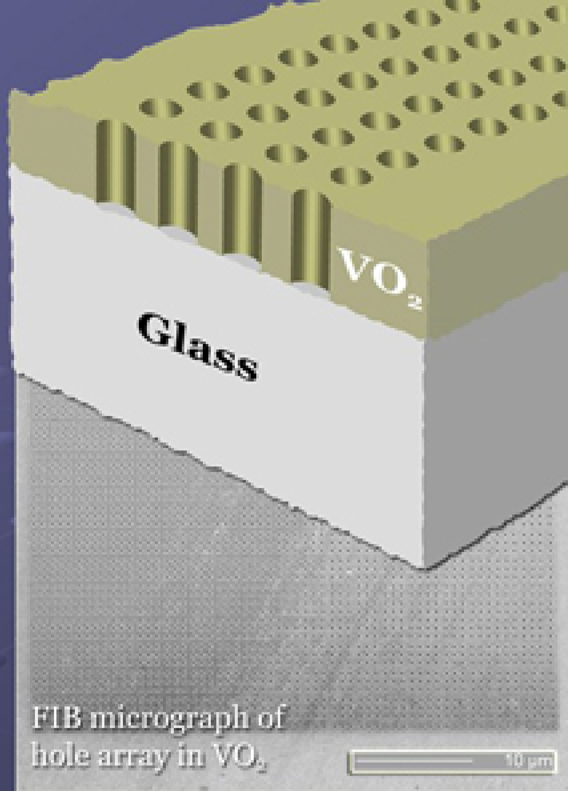


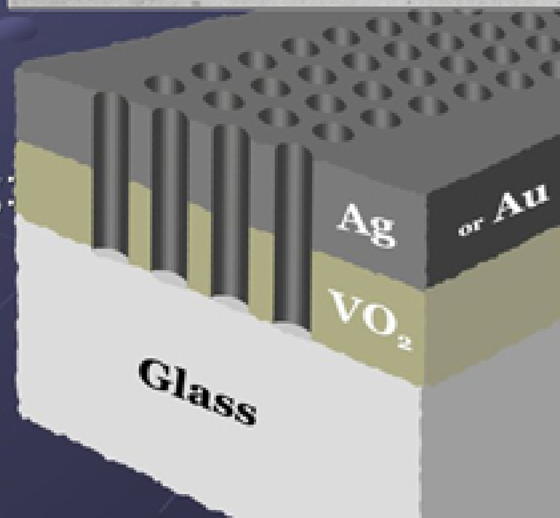
Periodic Hole Arrays in VO_2

- Fabricated periodic arrays of sub-wavelength holes in:
  - {Ag|VO_2] and {Au|VO_2] double-layers on glass;
  - single VO_2 layer on glass.

- Thermally induced metal-insulator phase transition in VO_2 layers

- Measured far-field optical transmission using:
  - far-field white-light illumination;
  - near-field laser illumination (visible and near-infrared wavelengths).





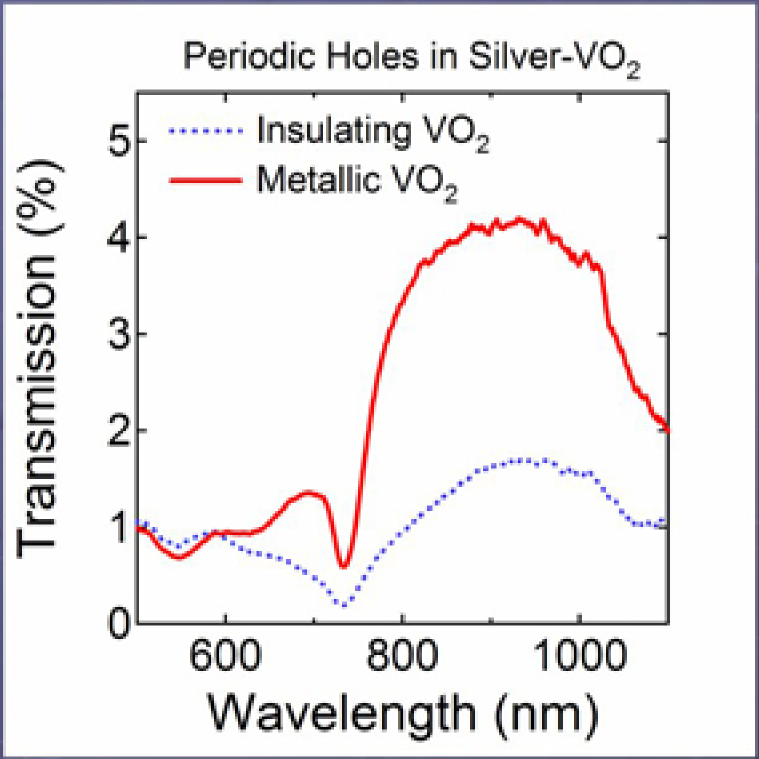
Periodic Hole Arrays

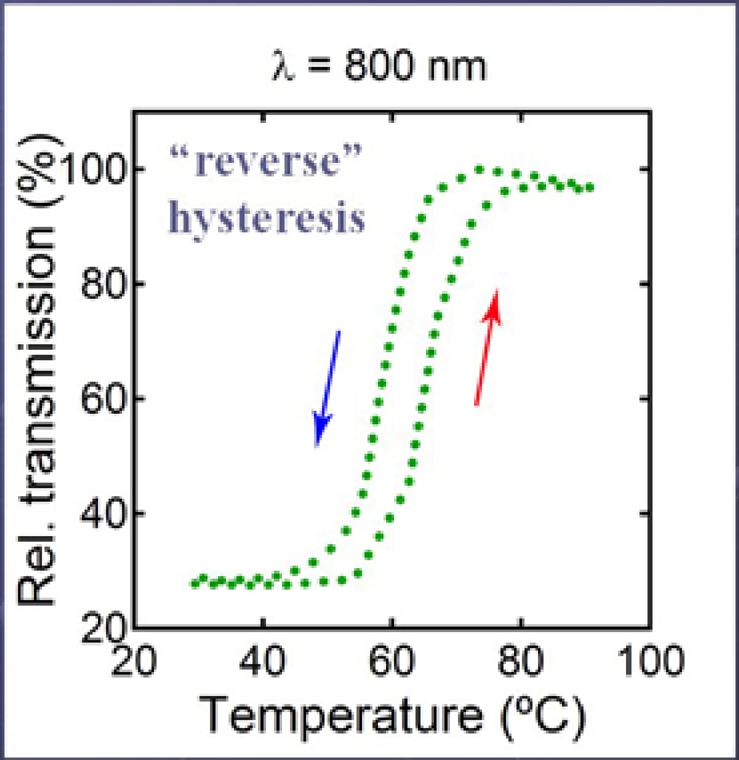
FIB micrograph of hole array in VO_2

- Diameter: 250 nm
- Spacing: 750 nm
- Depth: 200 nm
- №: 3600

Periodic Hole Arrays:

Counterintuitive Observations





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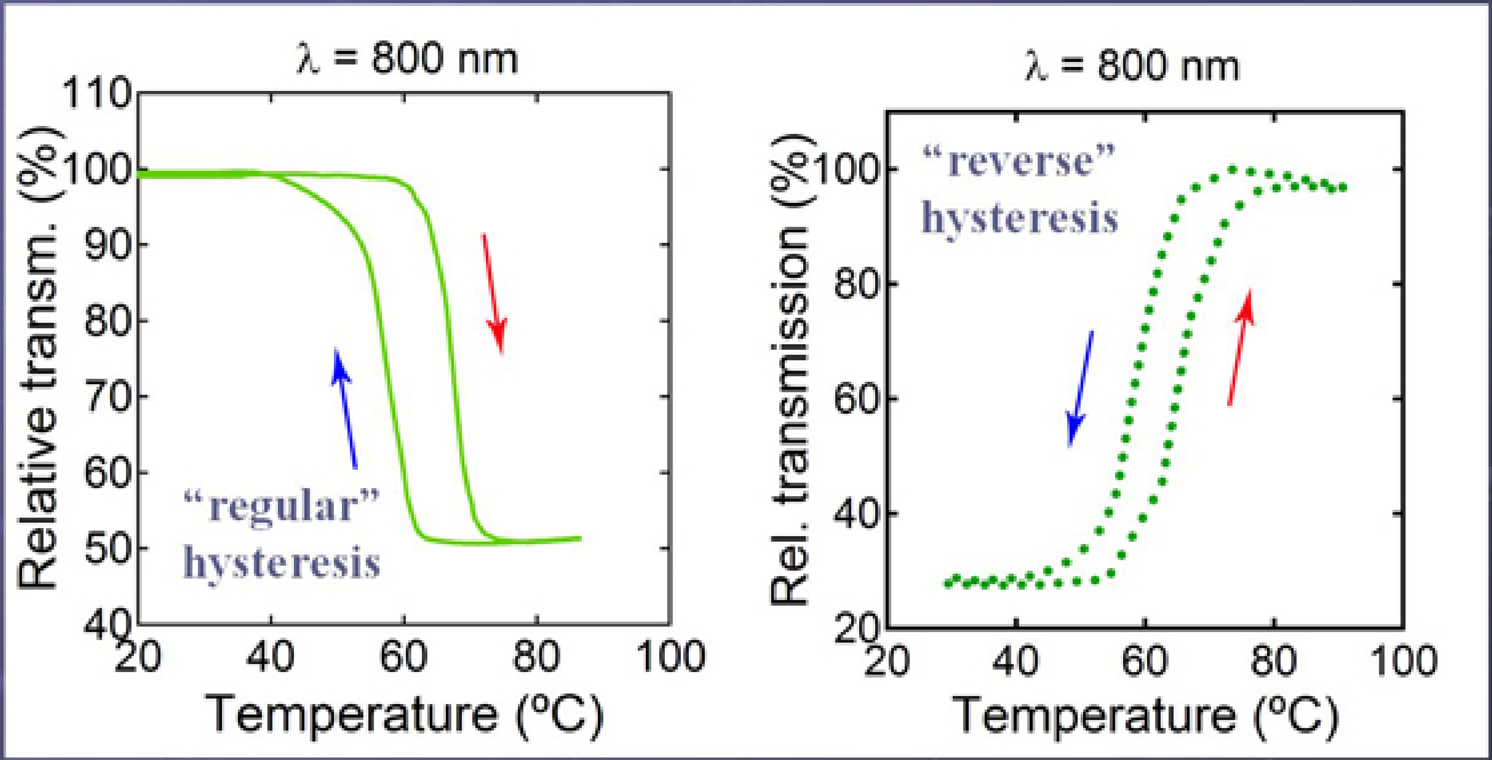
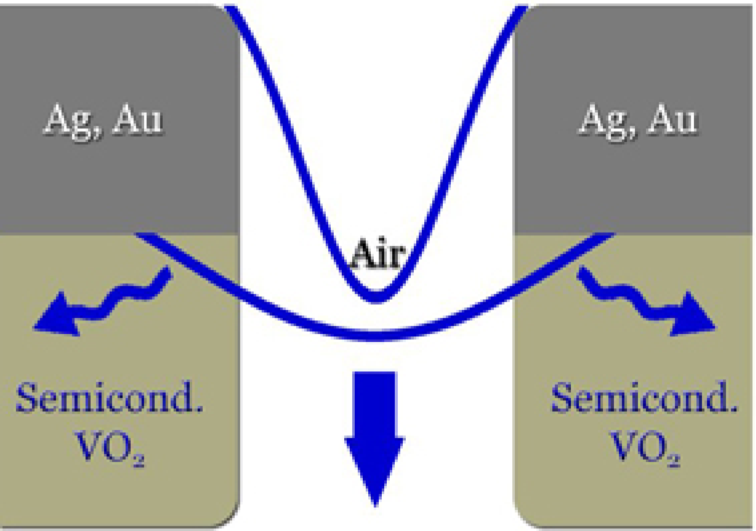
Counterintuitive Observations



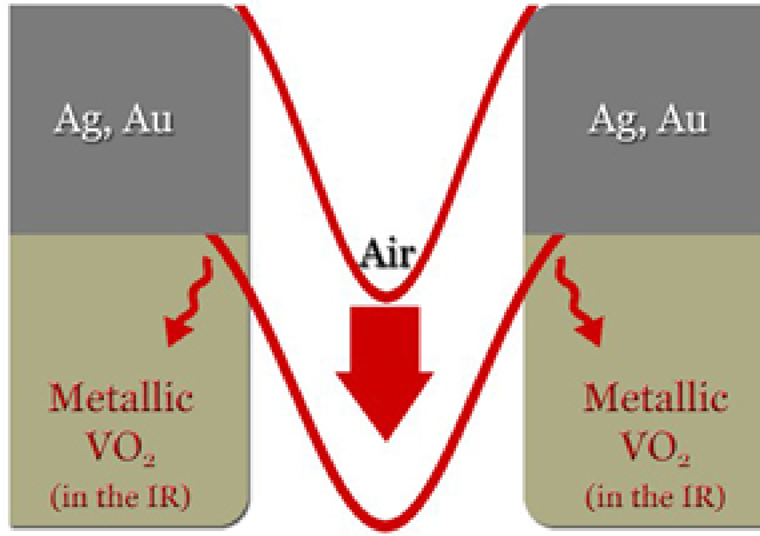
Our Model: Leaky waves + Diffuse scattering

- **Smaller** dielectric contrast between holes (air) and surrounding material (metallic VO_2 in the IR) leads to **reduction of intensity loss** from “leaky evanescent waves”.



Semiconducting VO_2

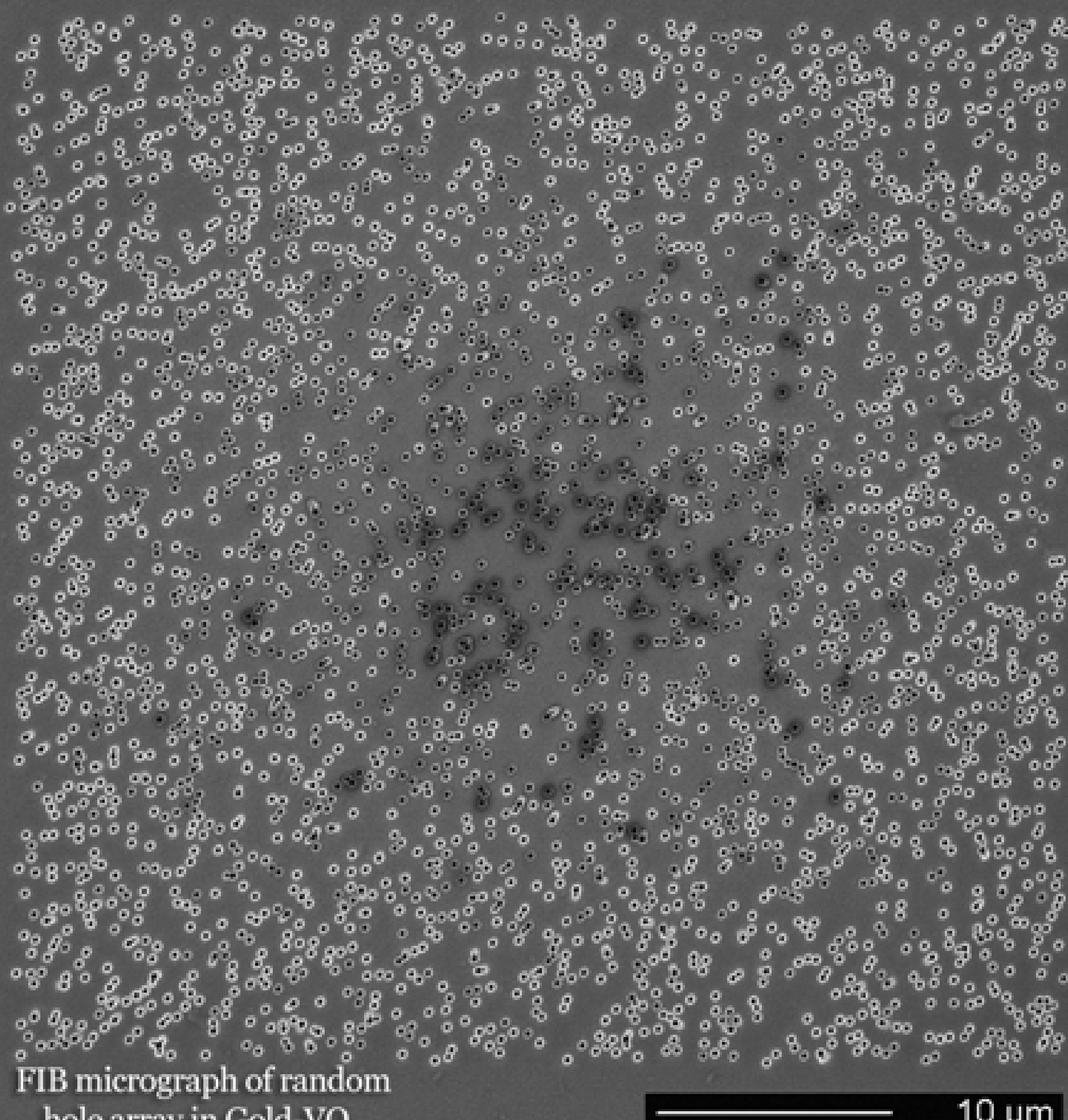
$\varepsilon_{real} = 8.8$ @ $\lambda = 980$ nm



Metallic VO_2

$\varepsilon_{real} = 1.0$ @ $\lambda = 980$ nm

Random Hole Arrays



FIB micrograph of random hole array in Gold-VO_2

- Diameter: 250 nm
- Spacing: random
- Depth: 200 nm
- №: 3600

Hole Arrays:
Periodic vs. Random