Supporting Information for

Conformal Coating of a Phase Change Material on Ordered Plasmonic Nanorod Arrays for Broadband All-Optical Switching

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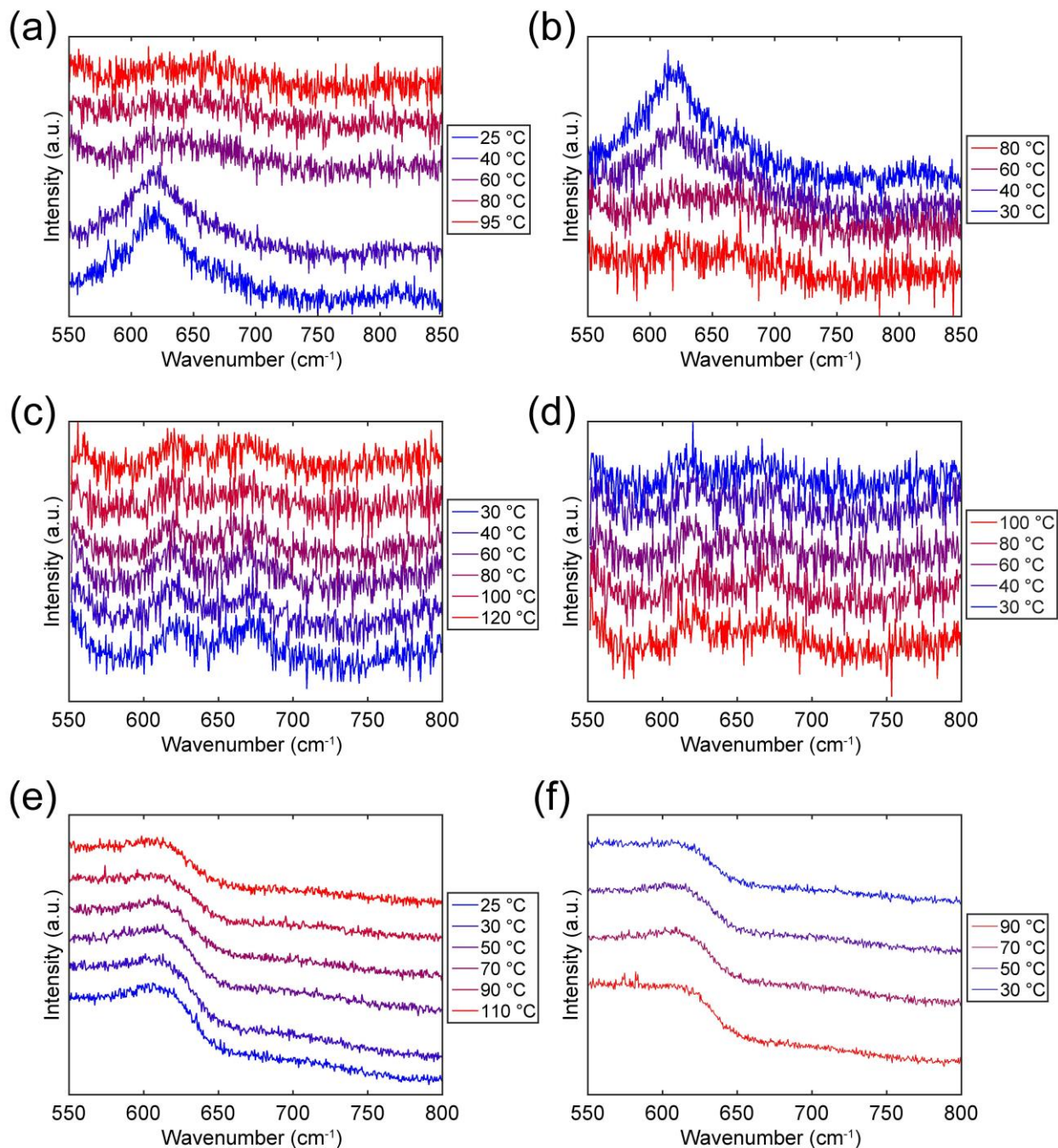*Email: schaller@anl.gov, schaller@northwestern.edu (Richard D. Schaller)

Figure S1. (a) and (b) Temperature dependent Raman spectra for VO_2 film deposited on witness Si/SiO_2 substrate (grown in the same batch with sample I). (a) was taken during heating whereas (b) was taken during cooling. (c) and (d) are same as (a) and (b) but are for a control Si/SiO_2 substrate without VO_2 coating. (e) and (f) are same as (a) and (b) but are for a control ITO-NRA sample without VO_2 coating. All curves are vertically displaced for clarity.
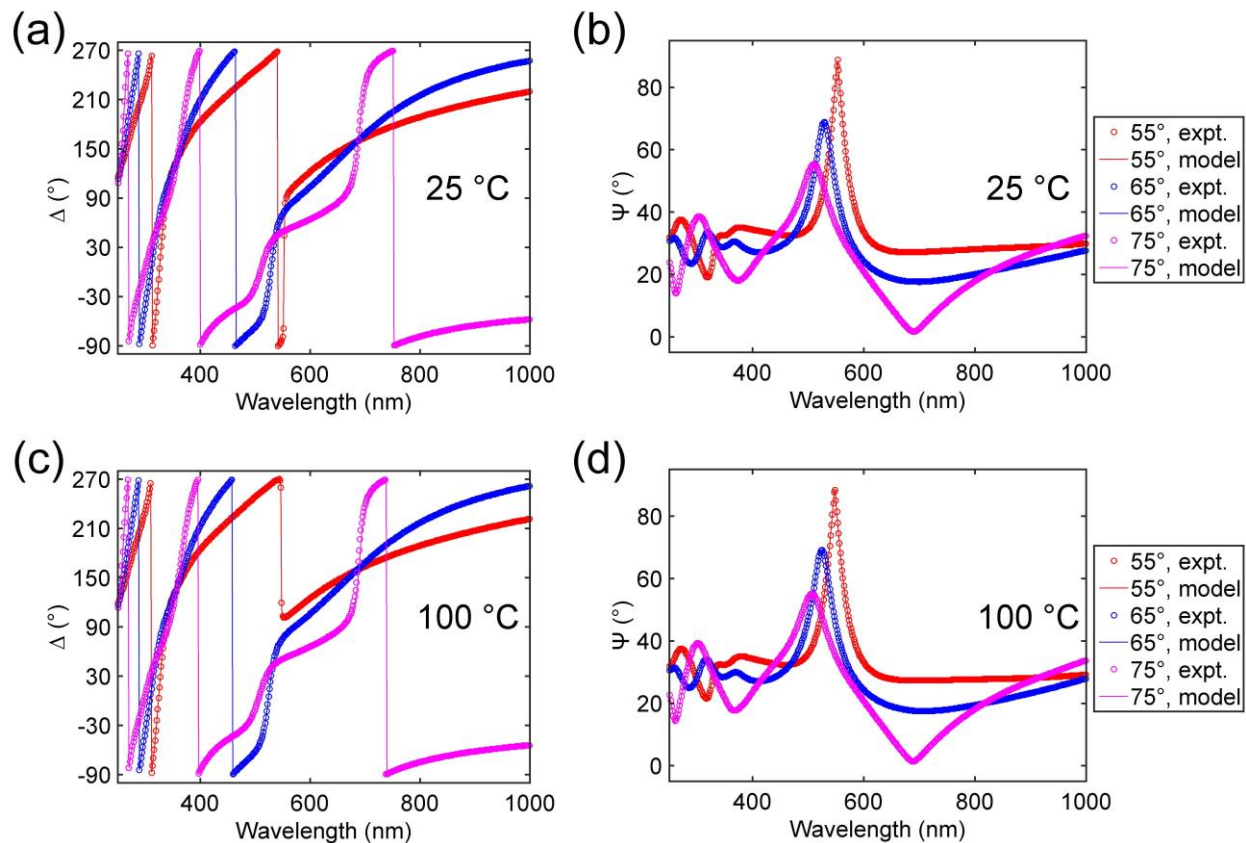
Figure S2. Δ and Ψ values for VO₂ film on witness Si/SiO₂ wafer (grown in the same batch with sample I) obtained from variable angle ellipsometric measurements performed at 25 °C shown in (a) and (b), and at 100 °C shown in (c) and (d). Fitting yielded a VO₂ thickness of 16.0 nm. The B-spline model in CompleteEASE (J.A. Woollam Co.) was used to fit the data.
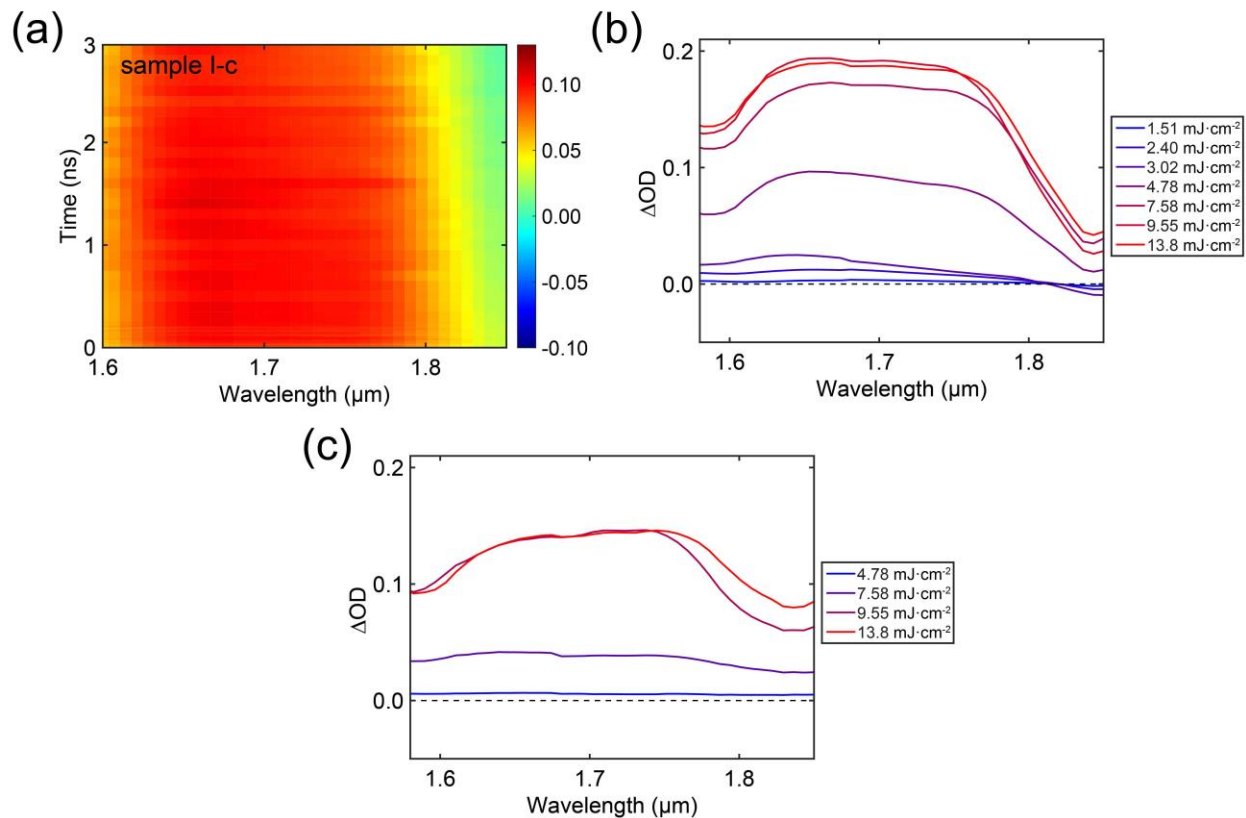
Figure S3. (a) Transient spectral map for sample I-c plotted for delay times up to 3 ns under pump wavelength of 1580 nm and fluence of 4.78 mJ·cm^{-2}. (b) Fluence dependent transient spectra for sample I-c averaged over delay time window from 2 ns to 3 ns. (c) Fluence dependent transient spectral for sample I-film-c averaged over delay time from 2 ns to 3 ns.
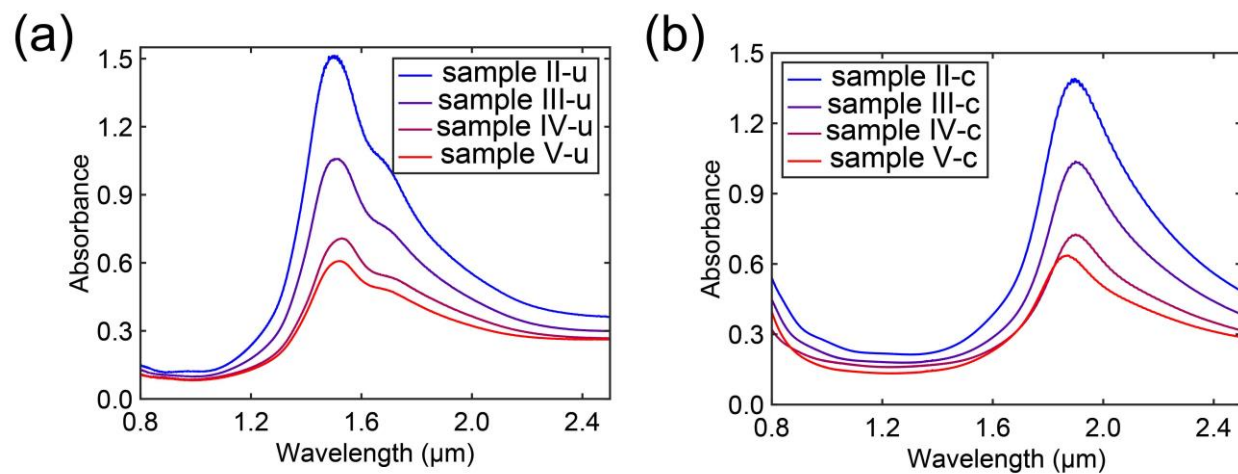

Figure S4. Near-infrared transmission spectra for sample II to sample V at normal incidence. (a) Before VO$_2$ coating. (b) After VO$_2$ coating.
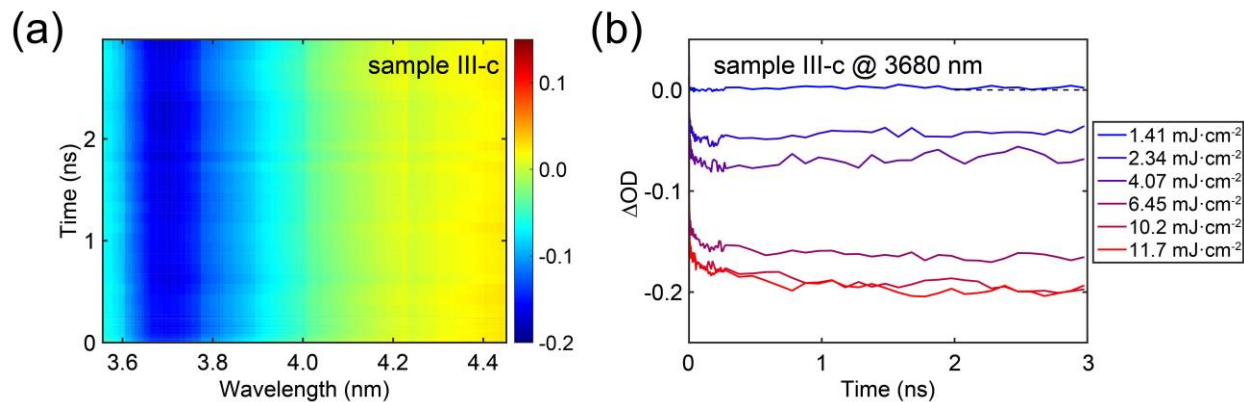
Figure S5. (a) Transient spectral map for sample III-c plotted for delay times up to 3 ns under pump wavelength of 1580 nm and fluence of 6.45 mJ·cm^{-2}. (b) Fluence dependent ΔOD kinetics for sample III-c at 3680 nm plotted for delay times up to 3 ns.
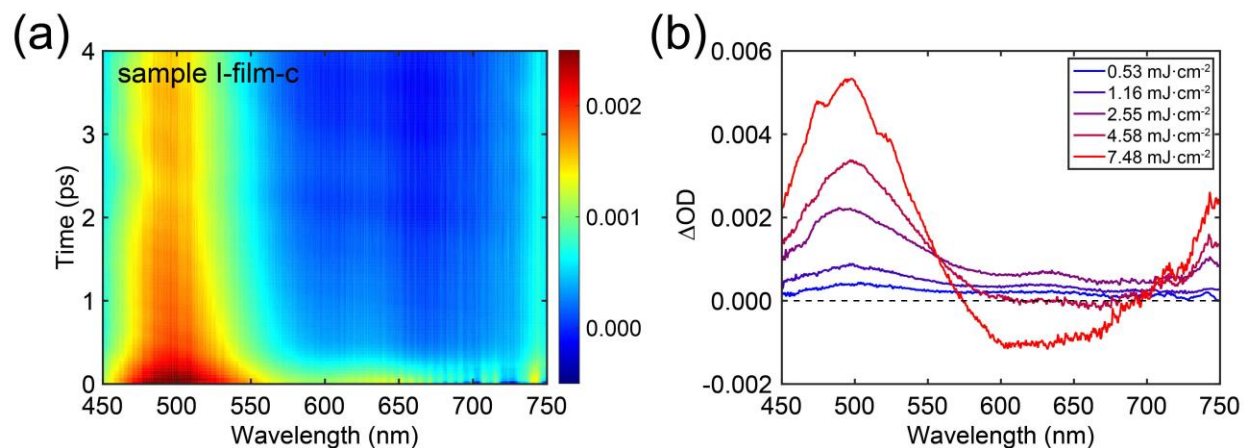

Figure S6. (a) Transient spectral map for sample I-film-c plotted for delay times up to 4 ps under pump wavelength of 1850 nm and fluence of 2.55 mJ·cm^{-2}. (b) Time averaged (from 2 ns to 3 ns delay time), fluence dependent transient spectra for sample I-film-c.
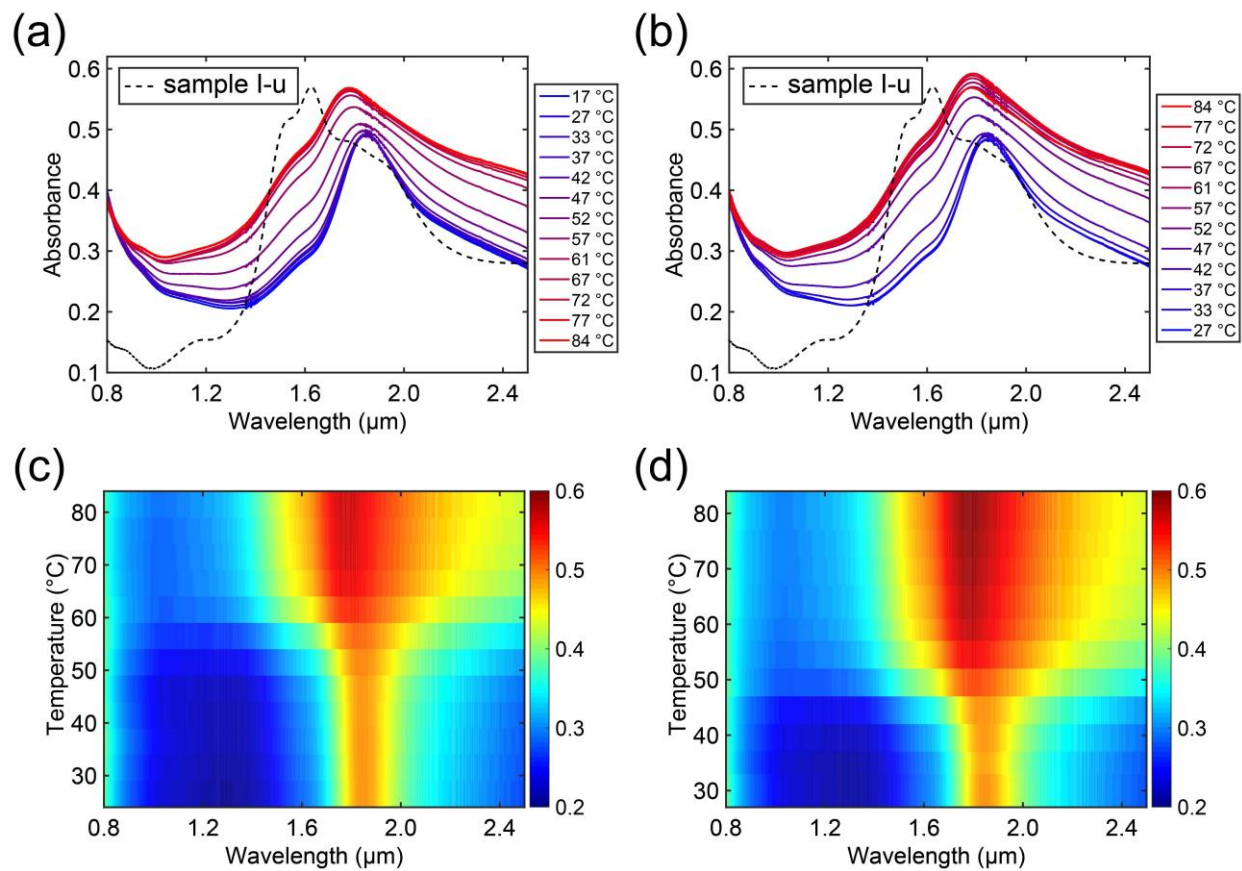
Figure S7. (a) Temperature dependent absorbance spectra for sample I-c during heating. (b) Temperature dependent absorbance spectra for sample I-c during cooling. Dashed lines in (a) and (b) are the absorbance spectra for sample I-u. (c) and (d) are color-coded versions of (a) and (b).
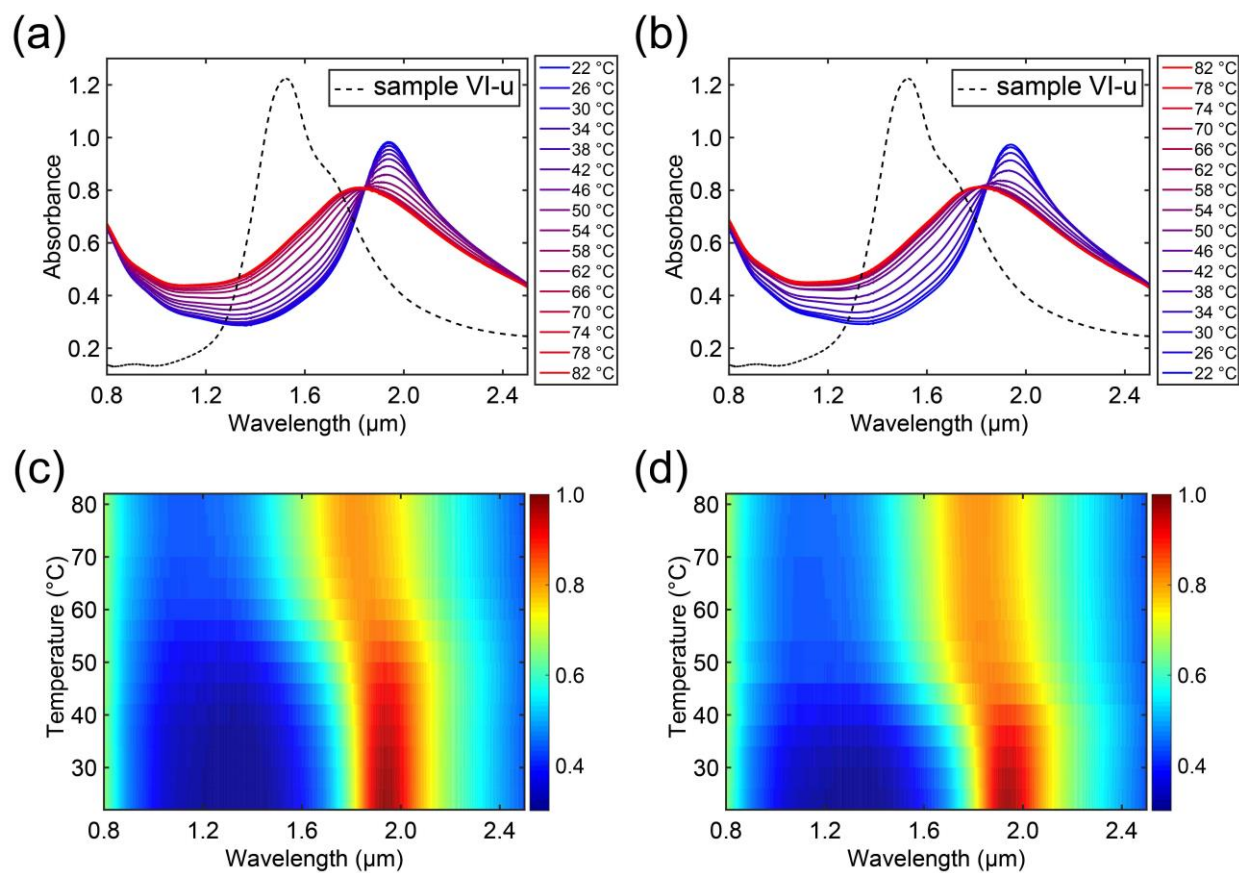
Figure S8. (a) Temperature dependent absorbance spectra for sample VI-c during heating. (b) Temperature dependent absorbance spectra for sample VI-c during cooling. Dashed lines in (a) and (b) are the absorbance spectra for sample VI-u. (c) and (d) are color-coded versions of (a) and (b).
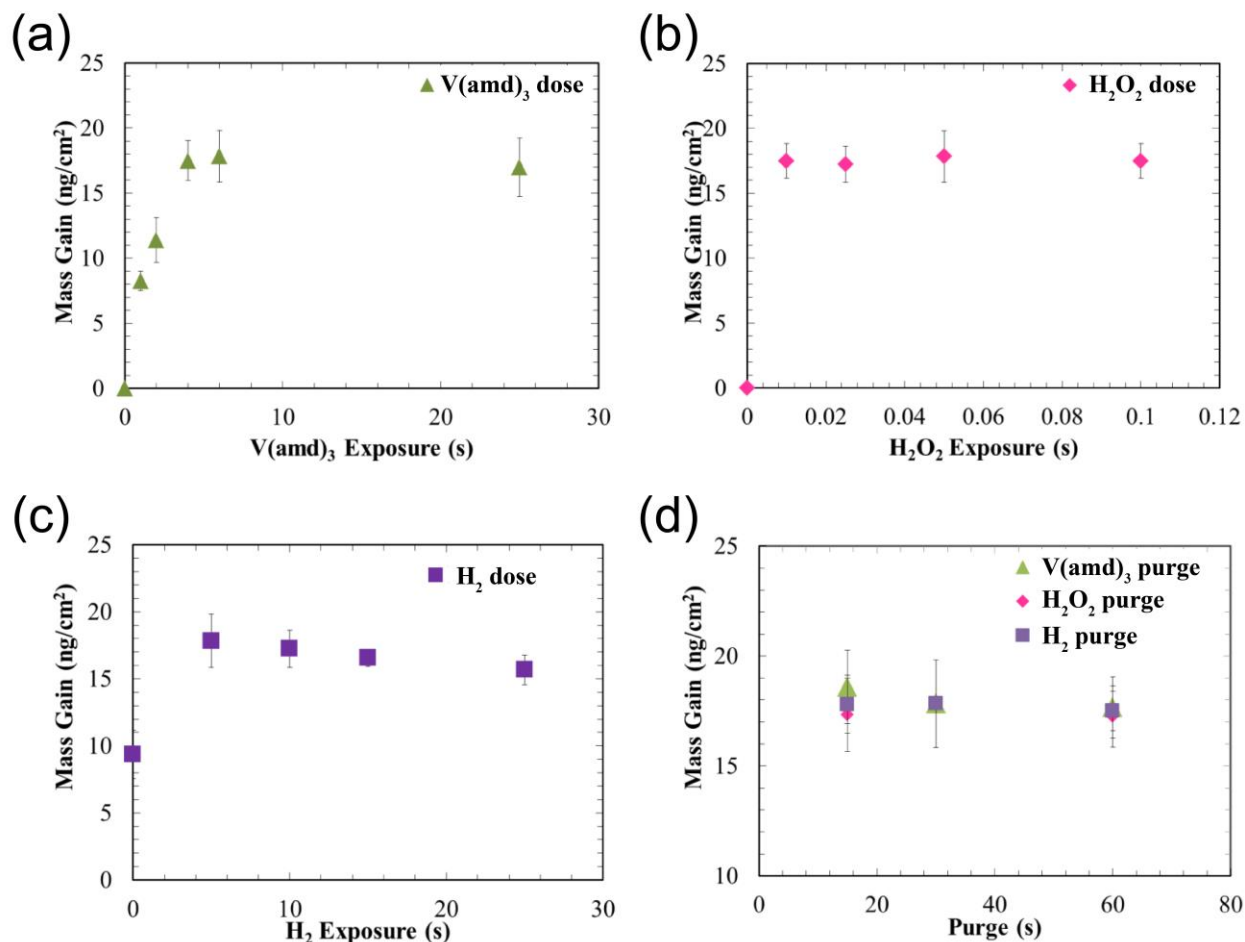
Figure S9. Plots for mass gain v.s. dose length of the $V(amd)_3/H_2O_2/H_2$ process at 200 °C for (a) $V(amd)_3$ (dose sequence follows x/30 sec/0.05 sec/20 sec/5 sec/30 sec). (b) H_2O_2 (dose sequence follows 6 sec/30 sec/x/20 sec/5 sec/30 sec). Plots for mass gain v.s. purge length of the $V(amd)_3/H_2O_2/H_2$ process at 200 °C for (d) $V(amd)_3$ (dose sequence follows 6 sec/x/0.05 sec/20 sec/5 sec/30 sec), H_2O_2 (dose sequence follows 6 sec/30 sec/0.05 sec/x/5 sec/30 sec), and H_2 (dose sequence follows 6 sec/30 sec/0.05 sec/20 sec/x). In all plots x was the variable shown in the x-axis.
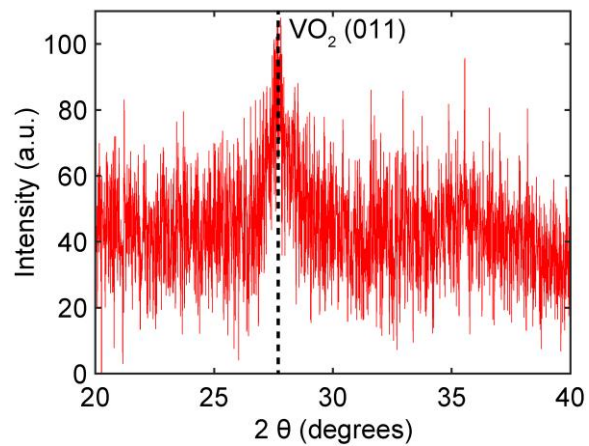
Figure S10. X-ray diffraction data (θ-2θ scan) for VO$_2$ film deposited on quartz substrate. The low signal-to-noise ratio is due to the ultrathin VO$_2$ thickness (~ 10 nm).