

## Supporting Information

### Local geometric and electronic structures of gasochromic VO<sub>x</sub> films

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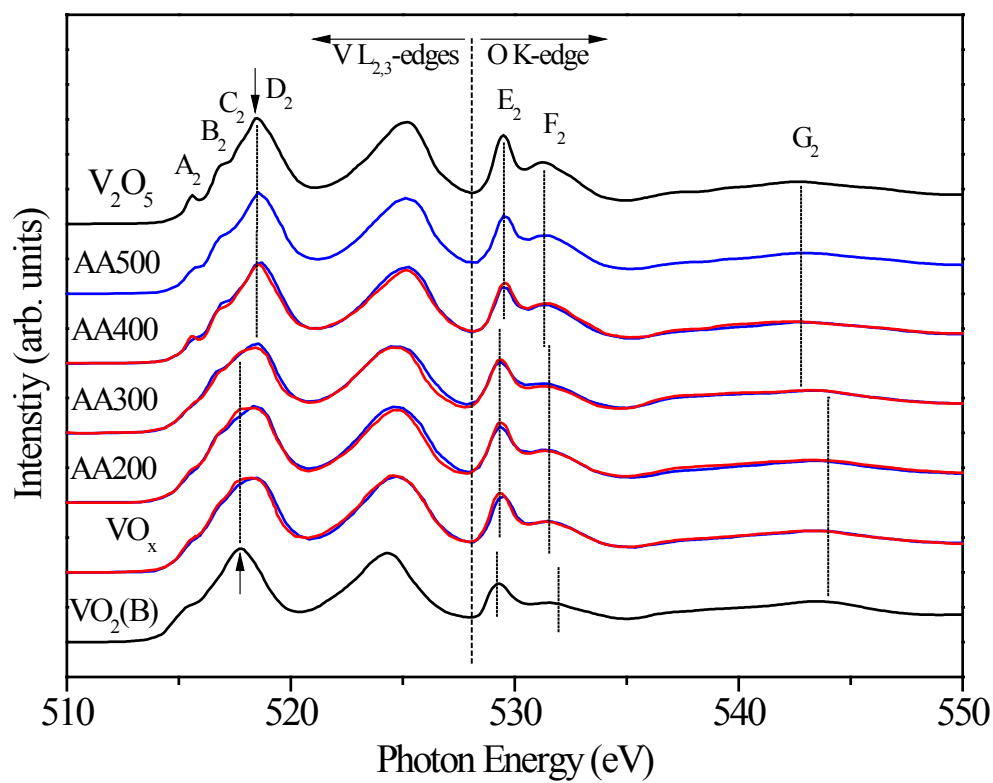
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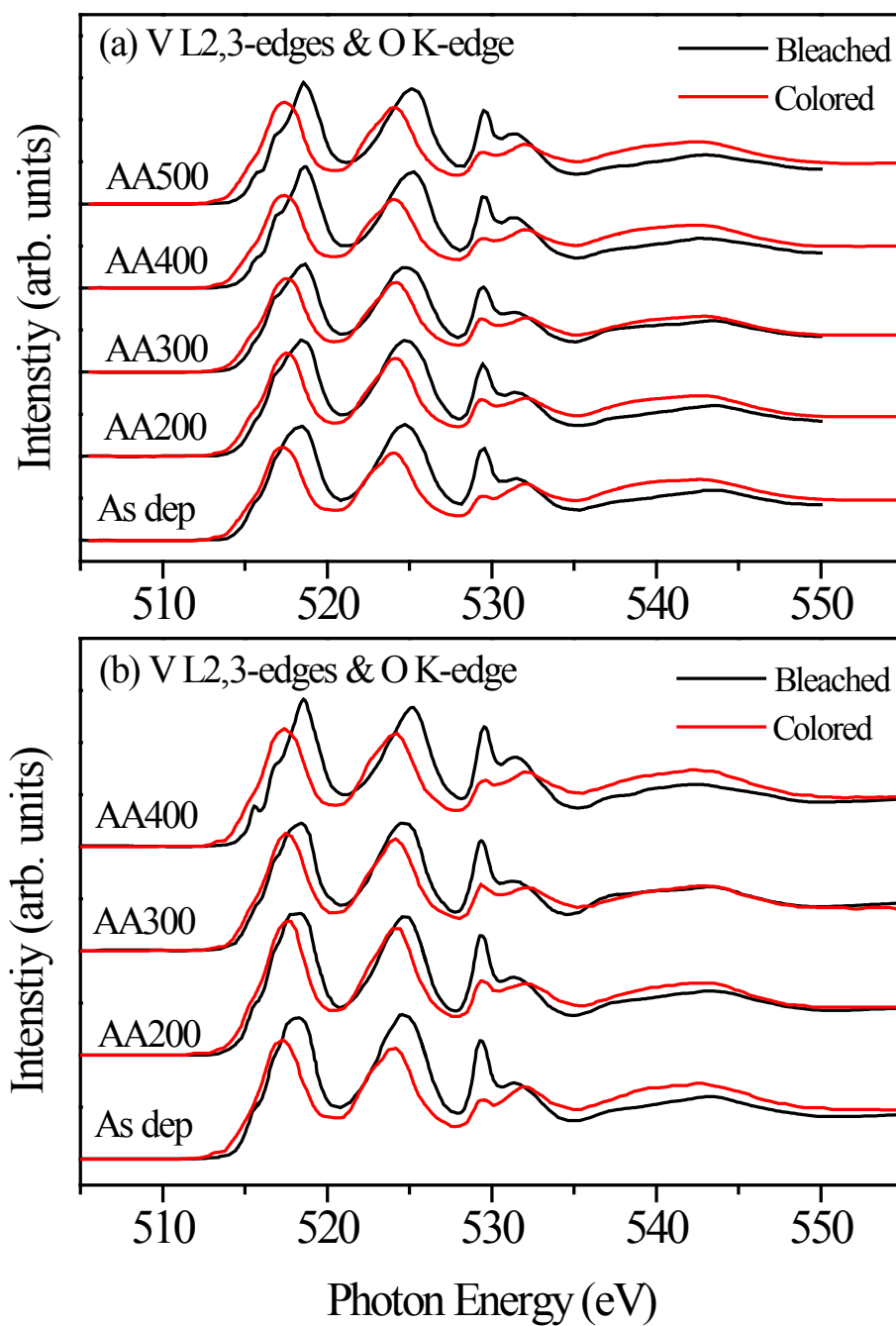
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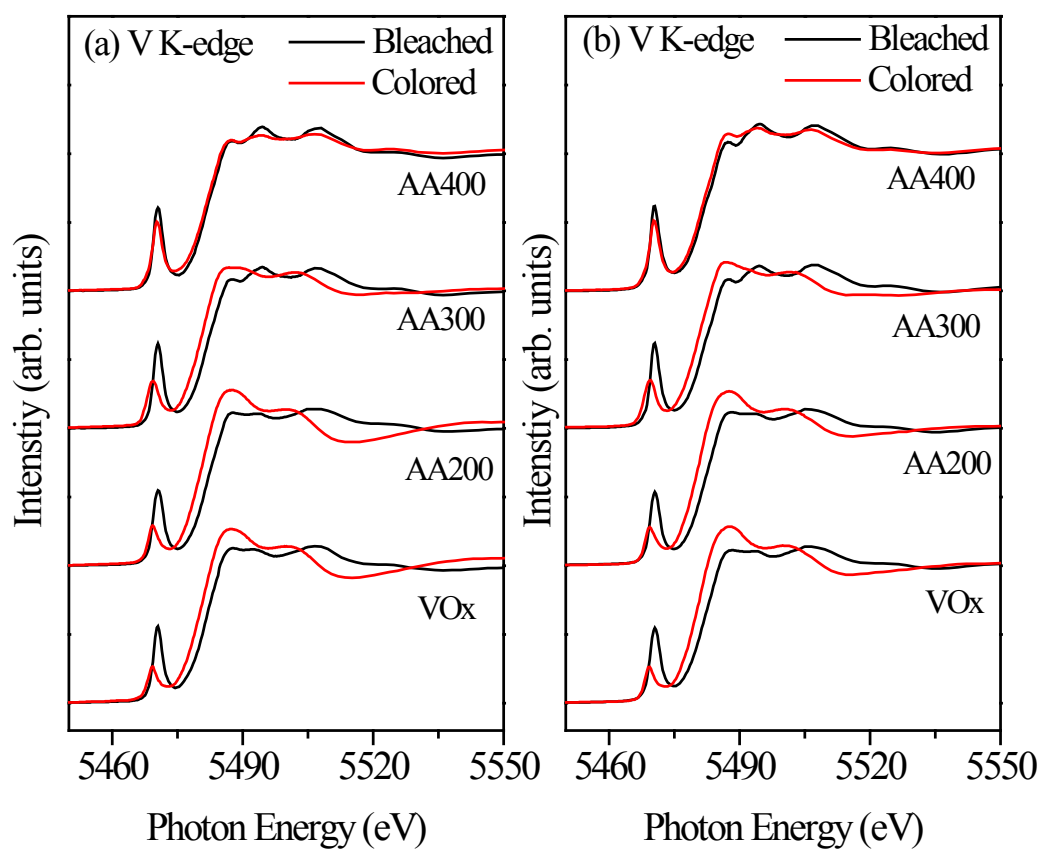
**Figure S1.** XAS spectra of V  $L_{2,3}$ -edge and O K-edge of as-deposited and annealed  $VO_x$  films (blue and red lines represent two measurements) and standard  $VO_2$  and  $V_2O_5$  samples (black lines).



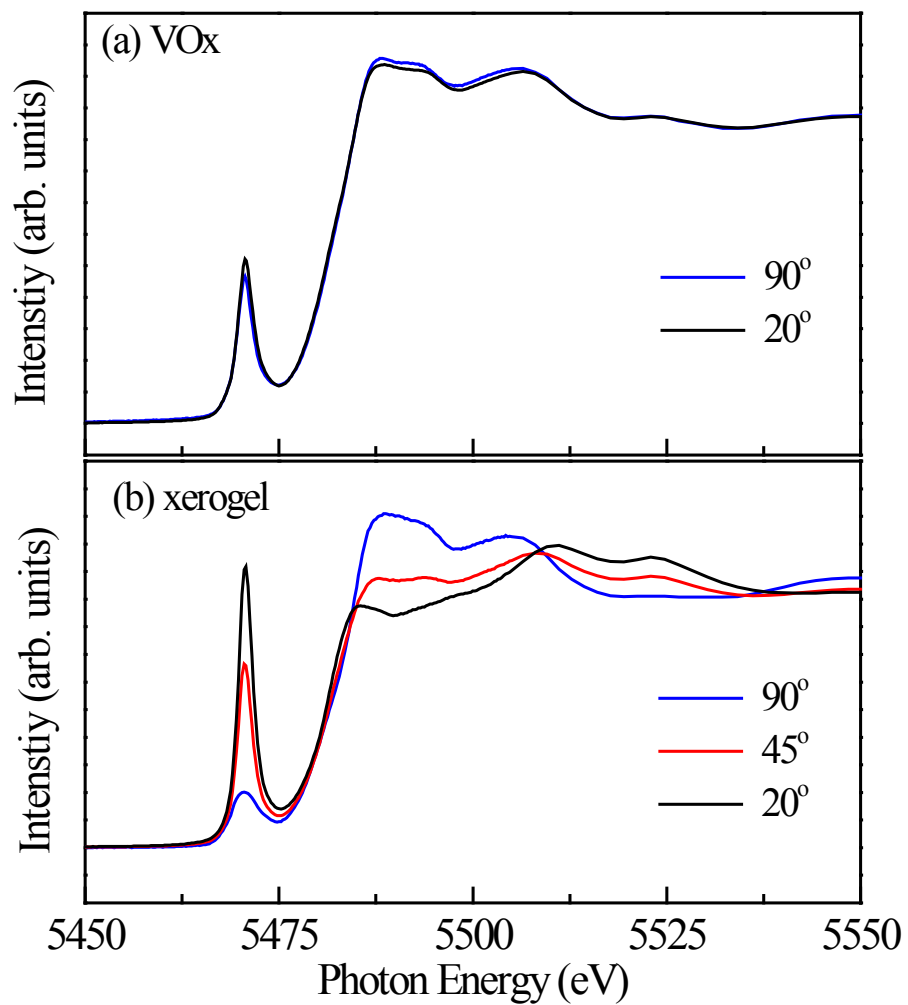
**Figure S2.** V L<sub>2,3</sub>-edge and O K-edge XAS of VO<sub>x</sub> films in bleached states (black lines) and colored states (red lines).



**Figure 3S.** V K-edge XAS spectra of films before (black lines) and after (red lines) gasochromic reaction from two measurements.



**Figure S4.** Polarized V K-edge XAS of (a) as-deposited  $\text{VO}_x$  and (b)  $\text{V}_2\text{O}_5$  xerogel for incidence angles of  $20^\circ$ ,  $45^\circ$ , and  $90^\circ$ .



**Figure 5S.** Polarized V K-edge XAS spectra of hydrogen-saturated VO<sub>x</sub> for incidence angles of 20° and 90°.

