Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information for

Sulfur-Treated TiO_2 Shows Improved Alcohol Dehydration Activity and Selectivity

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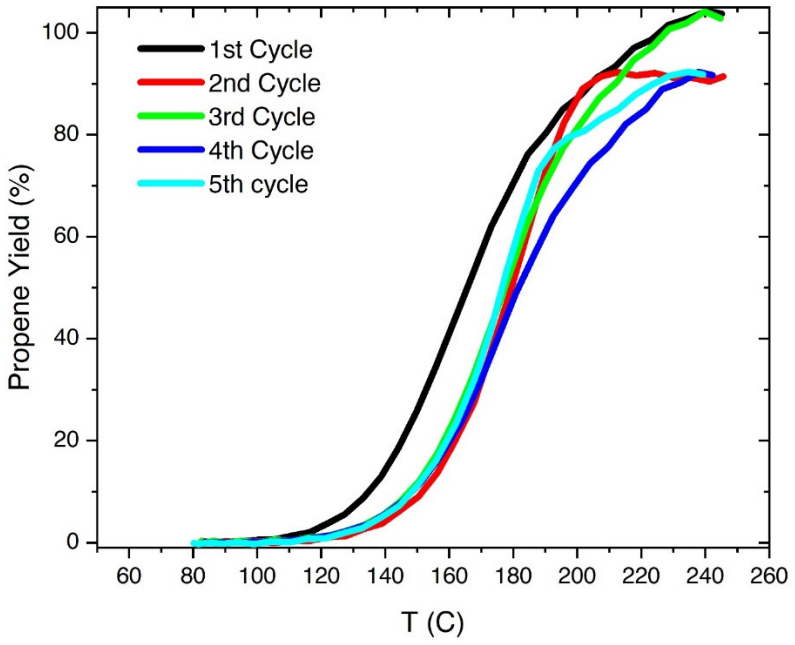
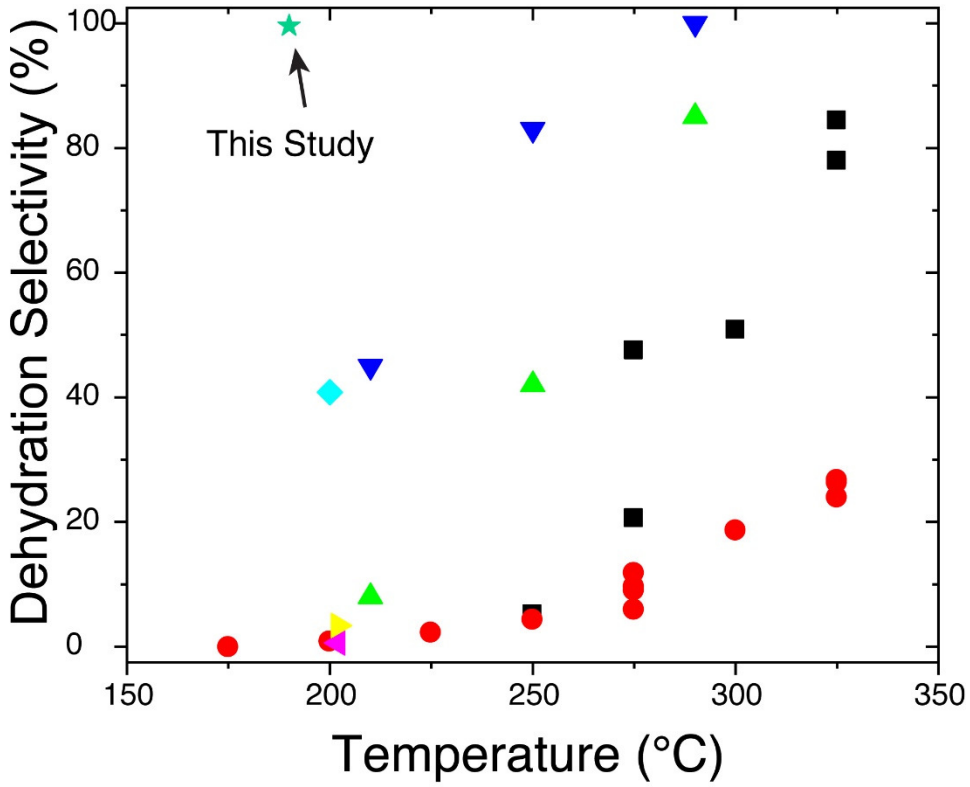
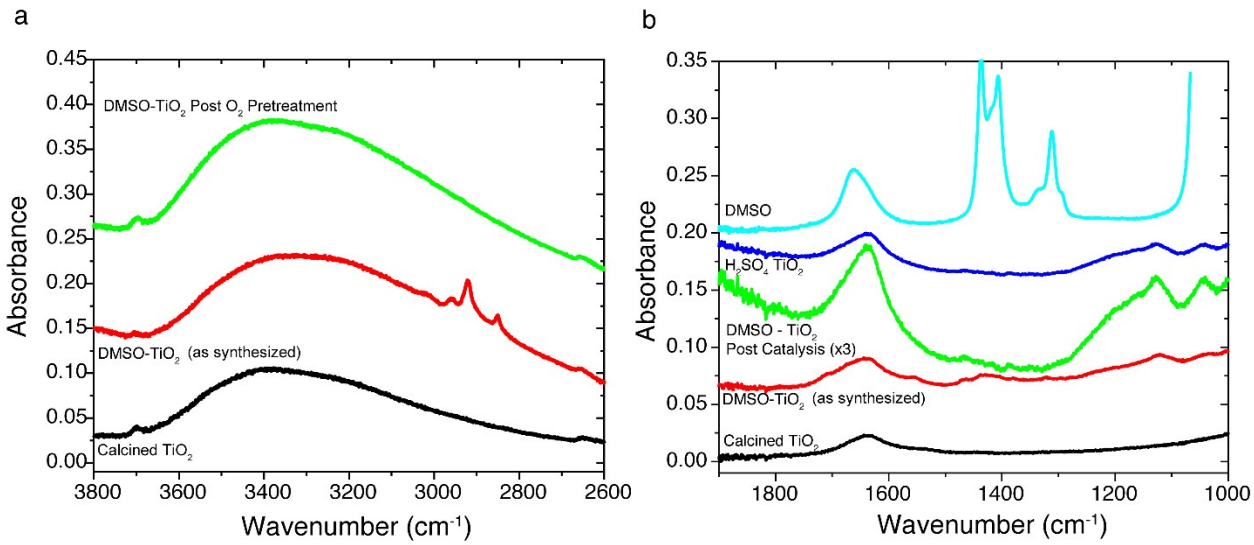


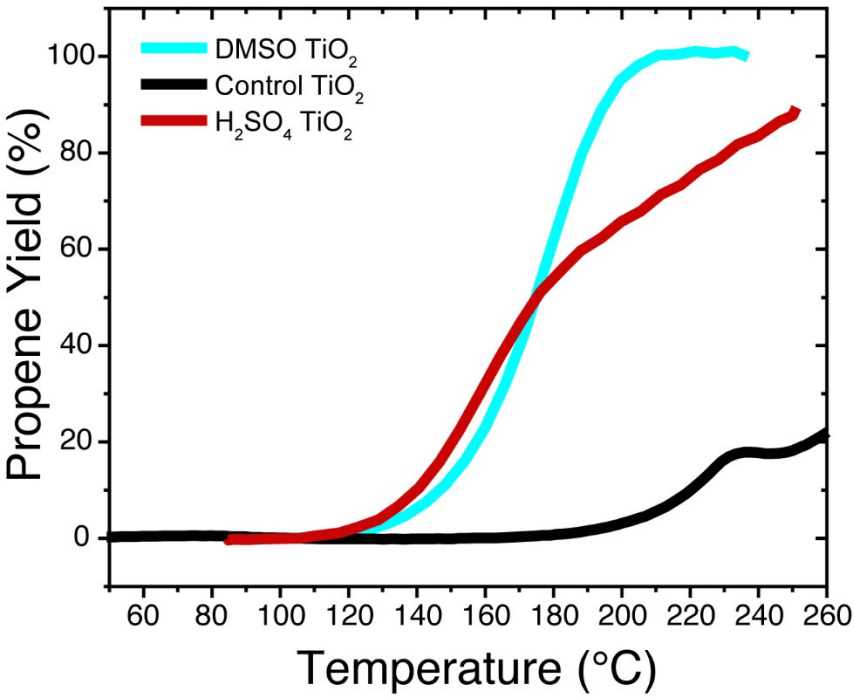
Supplemental Figure 1. Repeated lightoff experiments with DMSO-treated TiO_2 with constant 0.5% 2-propanol + balance Ar. 50 mL min^{-1} total flow rate.



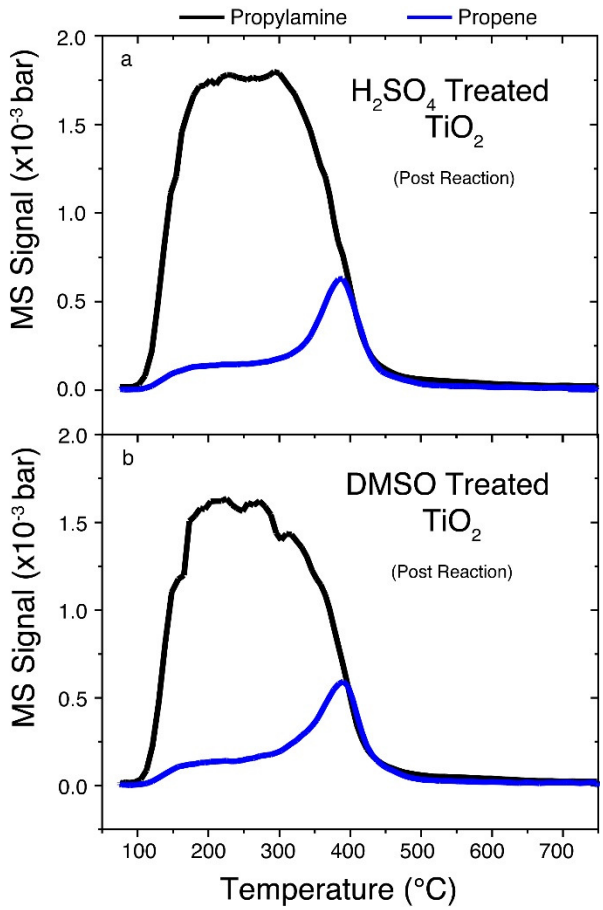
Supplemental Figure 2. Dehydration selectivities of experimental studies of TiO_2 based catalysts in inert gases unless otherwise noted. Red circles = ref [16], (anatase TiO_2 He + O_2 sweep gas), Black squares = ref [16] anatase TiO2 , Green triangles = ref [23] (anatase TiO_2) , Blue triangles = ref [23] (anatase $TiO_2 + H_3PO_4$) , Teal diamonds = [14] (commercial TiO_2 powder), Pink triangle = ref [22] (rutile TiO_2), Yellow triangle = ref [22] (commercial TiO_2), *Green star = DMSO-treated TiO_2 (this study).*



Supplemental Figure 3. FTIR spectra of the (a) C-H stretch and (b) fingerprint regions of TiO_2 based materials. Label descriptions: (a) black line indicates calcined TiO_2, Red indicates DMSO-treated $TiO_2$and the green line indicates DMSO-treated TiO_2 after 30 min under flowing 5% O_2 / 95% Ar at 250 °C. (b) : (a) black line indicates calcined TiO_2, Red indicates DMSO-treated TiO_2, green line indicates DMSO-treated TiO_2 after 2-propanol dehydration (2-propanol (0.5 vol%) + Argon, 5 thermal cycles from 30°C with 3 °C min^{-1} ramp rate to 250 °C followed by dwell at 250 °C for 30 min) blue line indicates H_2SO_4-treated TiO_2 and teal line indicates neat DMSO.



Supplemental Figure 4. Propene yield comparison of DMSO- treated TiO_2, H_2SO_4-treated TiO_2 and Calcined TiO_2. Conditions: 2-propanol (0.5 vol%) + Argon, 50 mL min^{-1} total flow rate, 1°C min^{-1} ramp rate. Equal mass of catalyst in beds.



Supplemental Figure 5 Propylamine TPD of (a) H_2SO_4-treated TiO_2 (b) DMSO-treated TiO_2 Post Catalysis. Reaction conditions: 2-propanol (0.5 vol%) + Argon, 50 mL min^{-1} total flow rate, 1°C min^{-1} ramp rate 200°C dwell for 15 hours. Temperature programmed desorption conditions: 20 mL min^{-1} gas flow, 10 °C min^{-1} temperature ramp rate.

Supplementary Table 1. Propylamine desorption peaks

Sample	Propylamine Desorption Area (bar °C)	Propene Desorption Area (bar °C)	Brønsted Acid Site Concentration (μmol g^{-1})
DMSO-treated TiO_2 (post catalysis)	0.39	0.076	28.2
H_2SO_4-treated TiO_2 (post catalysis)	0.44	0.083	33.5