

Electronic supplementary information (ESI) for

Platinum-supporting hollandite-type vanadium–chromium mixed oxides as efficient heterogeneous catalysts for deoxygenation of sulfoxides under atmospheric H₂ pressure

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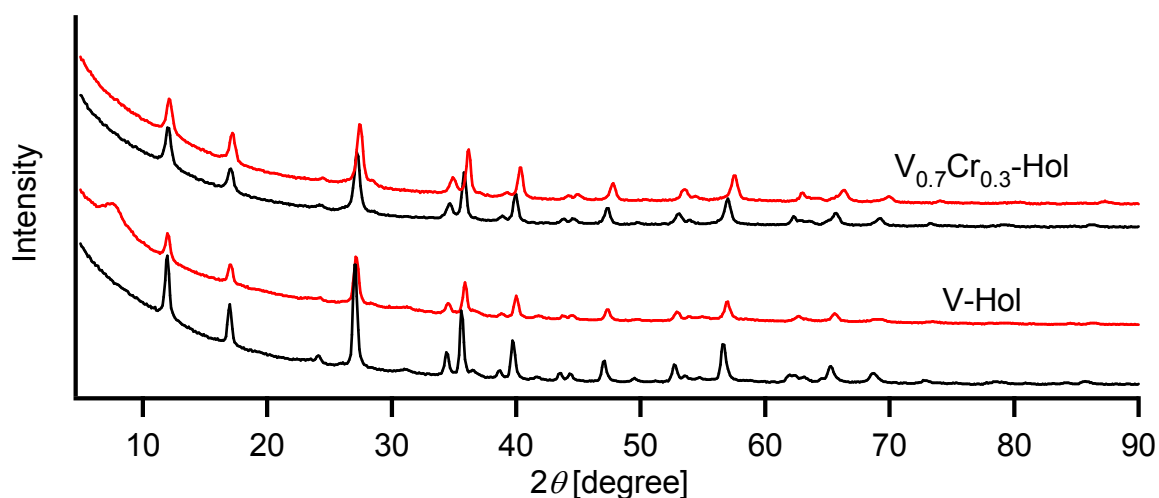


Fig. S1 XRD patterns of as-prepared V-Hol and V_{0.7}Cr_{0.3}-Hol (black lines), and the patterns of the retrieved V-Hol and V_{0.7}Cr_{0.3}-Hol after the deoxygenation of **1a** using DMF solvent (red lines). Reaction conditions: V-Hol or V_{0.7}Cr_{0.3}-Hol (30 mg), **1a** (0.5 mmol), DMF (1 mL), Ar (1 atm), 100°C, 24 h.

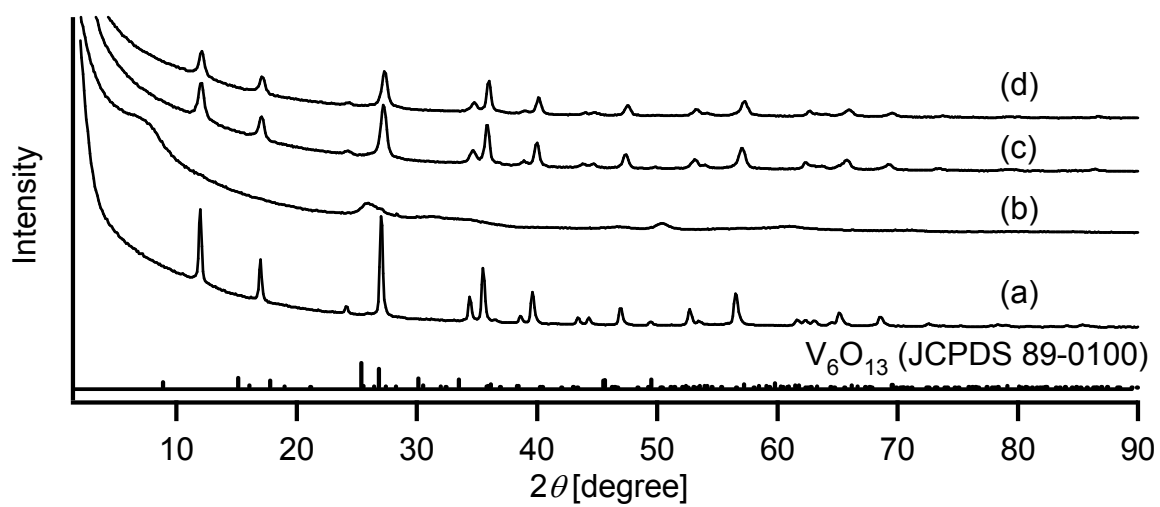


Fig. S2 XRD patterns of (a) V-Hol, (b) Pt/V-Hol, (c) $V_{0.7}Cr_{0.3}$ -Hol, and (d) Pt/ $V_{0.7}Cr_{0.3}$ -Hol.

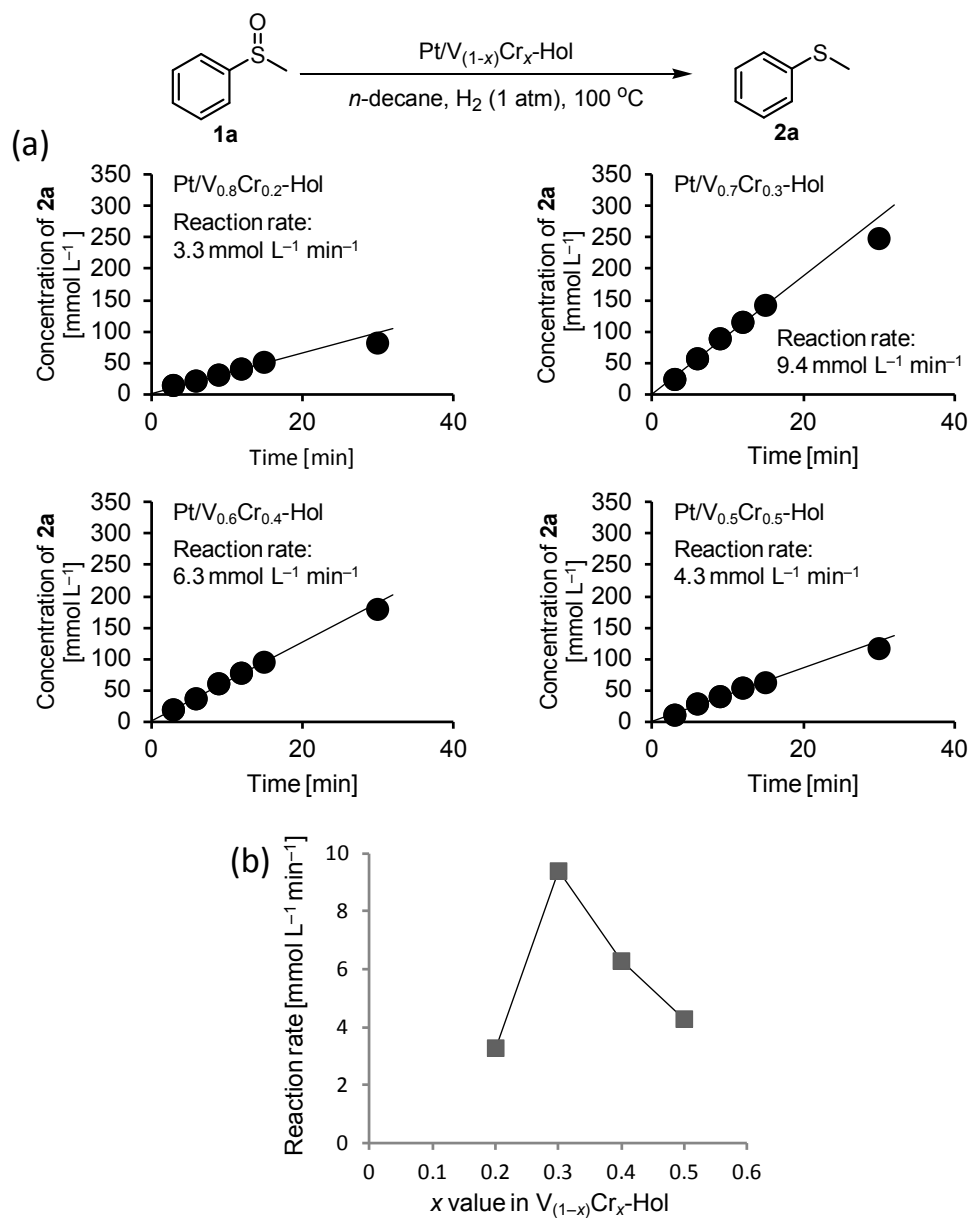


Fig. S3 (a) Reaction profiles and reaction rate of the deoxygenation of **1a** using Pt/V_(1-x)Cr_x-Hol and (b) relationship between the chromium contents and the reaction rates. Reaction conditions: Pt/V_(1-x)Cr_x-Hol, (30 mg), **1a** (0.5 mmol), *n*-decane (1 mL), H₂ (1 atm), 100°C. Catalysts were pretreated under 1 atm H₂ at 150°C. Yields were determined by GC analysis using naphthalene as an internal standard.

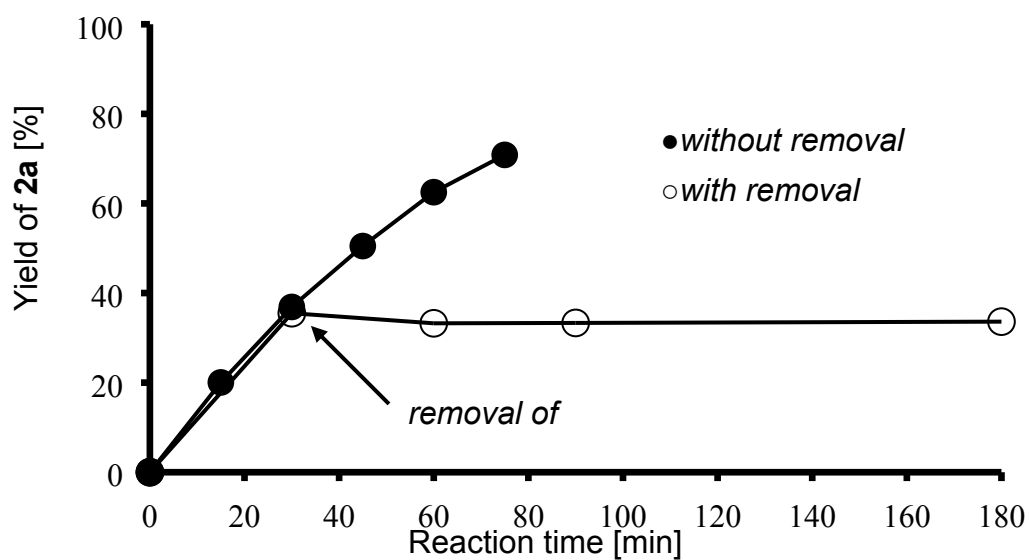


Fig. S4 Effect of removal of Pt/V_{0.7}Cr_{0.3}-Hol on the deoxygenation of **1a**; without (●) or with removal of Pt/V_{0.7}Cr_{0.3}-Hol (○). The arrow indicates the removal of Pt/V_{0.7}Cr_{0.3}-Hol. Reaction conditions: Pt/V_{0.7}Cr_{0.3}-Hol (30 mg), **1a** (0.5 mmol), *n*-decane (1 mL), 100°C, H₂ (1 atm). Catalysts were pretreated under 1 atm H₂ at 150°C for 30 min. Yields were determined by GC analysis using naphthalene as an internal standard.

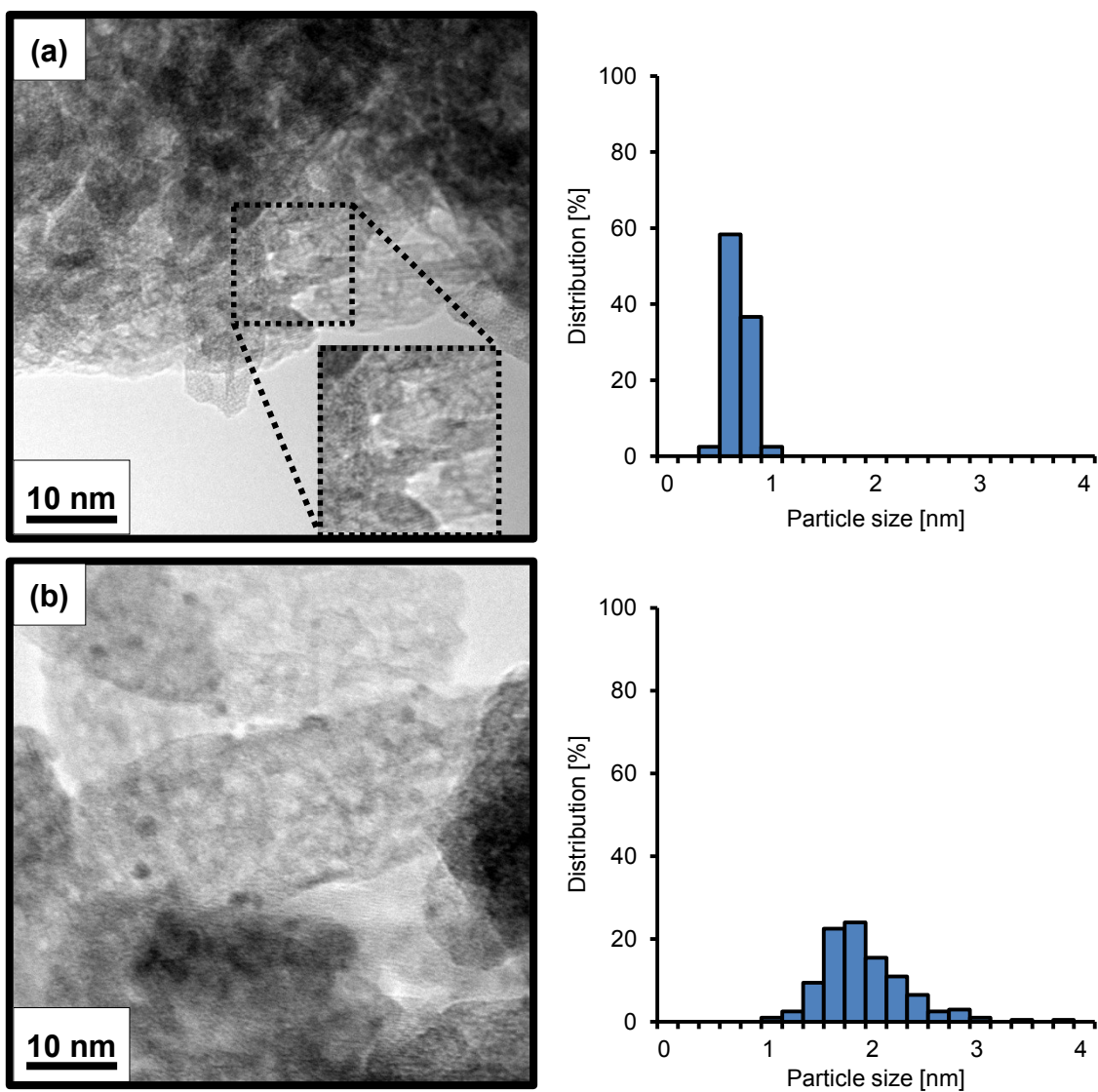


Fig. S5 TEM images and Pt particle size distributions of (a) as-prepared Pt/V_{0.7}Cr_{0.3}-Hol (mean diameter: 0.6 nm, $\sigma = 0.1$ nm) and (b) Pt/V_{0.7}Cr_{0.3}-Hol retrieved after the deoxygenation of **1a** under the conditions described in Fig. 7 (mean diameter: 1.8 nm, $\sigma = 0.4$ nm). The size distributions were determined using 200 particles.

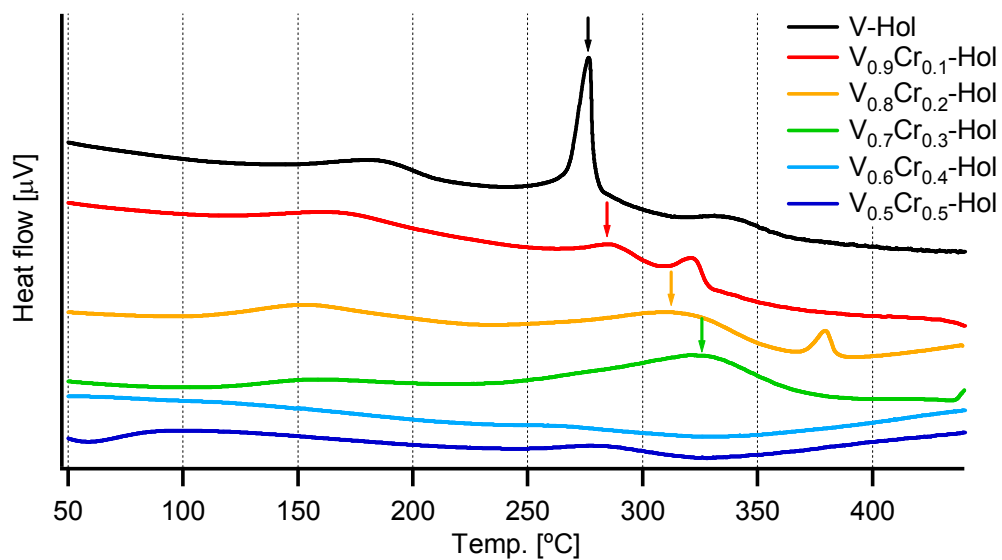


Fig. S6 DTA profiles of V-Hol and $V_{(1-x)}Cr_x$ -Hol samples. DTA profiles were measured under air atmosphere. The arrows indicate the decomposition temperatures of their hollandite structures.