

Supporting Information

Anti-Markovnikov hydration of alkenes over platinum-loaded titanium oxide photocatalyst

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Supporting Information

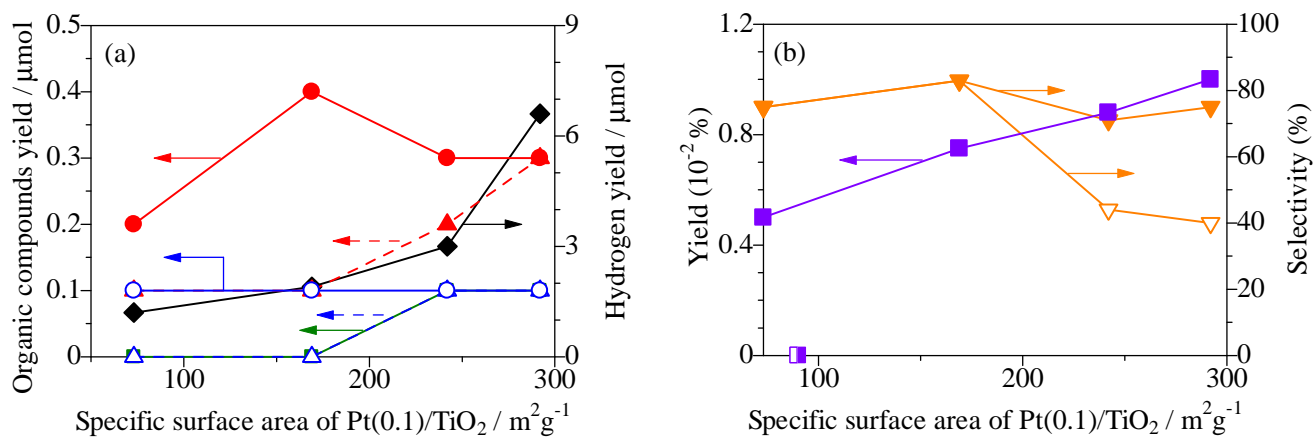


Fig. S1 The influence of the specific surface area and titanium oxide crystal phase of the Pt(0.1)/TiO₂ photocatalysts on the products yield (a), and the total yield and selectivity (b) in the photocatalytic hydration of 1-hexene. Red filled circles, red filled triangles, blue blank circles, blue blank triangles, green filled squares and black filled diamonds in panel a correspond to the yields of 1-hexanol, hexanal, 2-hexanol, 2-hexanone, coupling products and hydrogen, respectively. Purple filled squares, orange filled inverse triangles and orange blank inverse triangles in panel b correspond to the total yield of the alcohols and the carbonyl products, the anti-Markovnikov selectivity and the alcohol selectivity, respectively. Purple half-filled square correspond to the total yield with a Pt(0.1)/TiO₂(rutile) sample. Rutile titanium oxide (JRC-TIO-6) was donated from Catalysis Society of Japan. The specific surface area of the Pt(0.1)/TiO₂ was controlled by the calcination of the TiO₂ sample before the platinum loading. The above samples were the Pt(0.1)/TiO₂ sample prepared from the uncalcined TiO₂ and those prepared from the TiO₂ calcined at 873 K, 673 K or 473 K for 5 h. The specific surface area of the prepared photocatalysts was calculated by the BET method from the amount of adsorbed nitrogen at 77 K measured with a Quantachrome Monosorb. The reaction condition was: catalyst, 0.2 g; 1-hexene, 1.0 ml (8.0 mmol); water, 1.0 ml (56 mmol); reaction time, 60 min; reaction temperature, 305 K; irradiated light wavelength, >370 nm; irradiated light intensities were 3, 10, and 84 mW cm⁻² when measured at 254±10, 365±15 and 405±30 nm, respectively.

Supporting Information

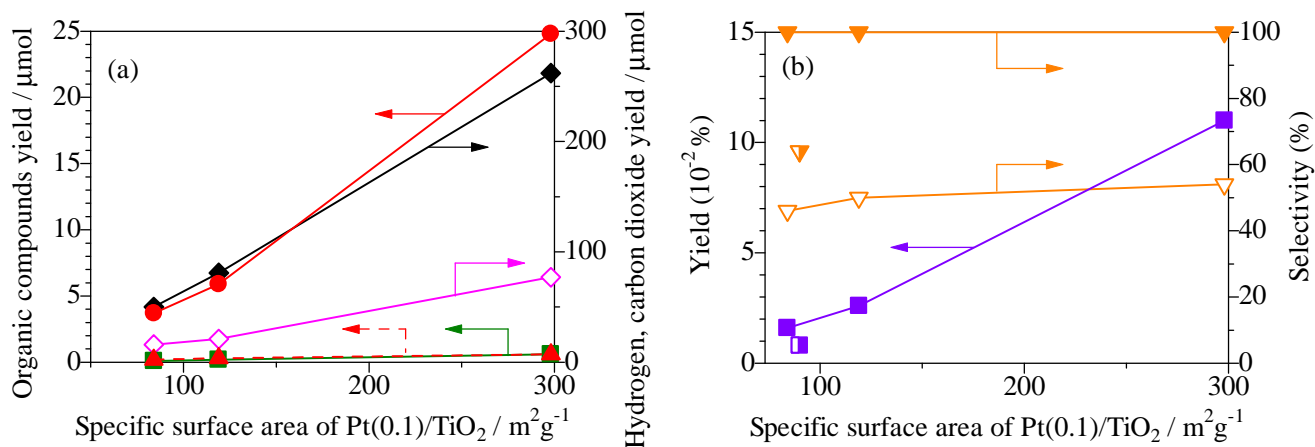


Fig. S2 The influence of the specific surface area and titanium oxide crystal phase of the Pt(0.1)/TiO₂ photocatalysts on the products yield (a), and the total yield and selectivity (b) in the photocatalytic hydration of thiophene. Red filled circles, red filled triangles, green filled squares, black filled diamonds and pink blank diamonds in panel a correspond to the yields of 2,3-dihydro-2-hydroxythiophene, 2,3-dihydrothiophene-2-one, coupling products, hydrogen and carbon dioxide, respectively. Purple filled squares, orange filled inverse triangles and orange blank inverse triangles in panel b correspond to the total yield of the alcohols and the carbonyl products, the anti-Markovnikov selectivity and the alcohol selectivity, respectively. Purple half-filled square and orange half-filled inverse triangle correspond to the total yield and the alcohol selectivity with a Pt(0.1)/TiO₂(rutile) sample. Rutile titanium oxide (JRC-TIO-6) was donated from Catalysis Society of Japan. The specific surface area of the Pt(0.1)/TiO₂ samples was controlled by the calcination of the TiO₂ (JRC-TIO-8) before the platinum loading. The above samples were the Pt(0.1)/TiO₂ sample prepared from the uncalcined TiO₂ and the Pt(0.1)/TiO₂ prepared from the TiO₂ calcined at 773 K or 673 K for 5 h. The specific surface area of the prepared photocatalysts was calculated by the BET method from the amount of adsorbed nitrogen at 77 K measured with a Quantachrome Monosorb. The reaction condition was: catalyst, 0.2 g; thiophene, 2.0 ml (24 mmol); water, 8.0 ml (440 mmol); reaction time, 180 min; reaction temperature, 314 K; irradiated light intensities were 23, 80, and 176 mW cm⁻² when measured at 254±10, 365±15 and 405±30 nm, respectively.

Supporting Information

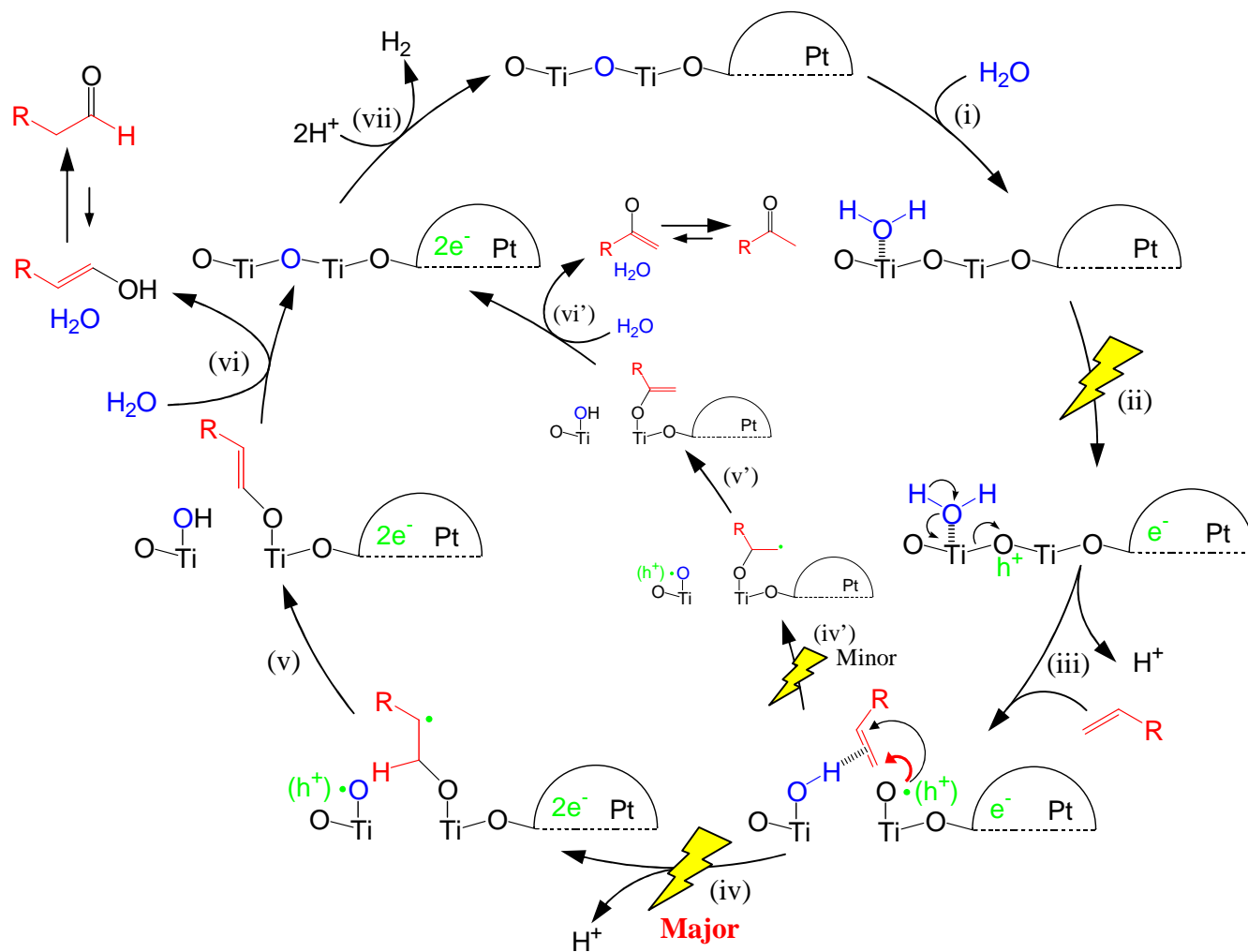


Fig. S3 The proposed reaction mechanism of the photocatalytic oxidation of alkene to produce the carbonyl compounds.