Electronic Supplementary Information

Synthesis of Camphene by α-Pinene Isomerization Using Acid Nano Titanium Dioxide Catalysts

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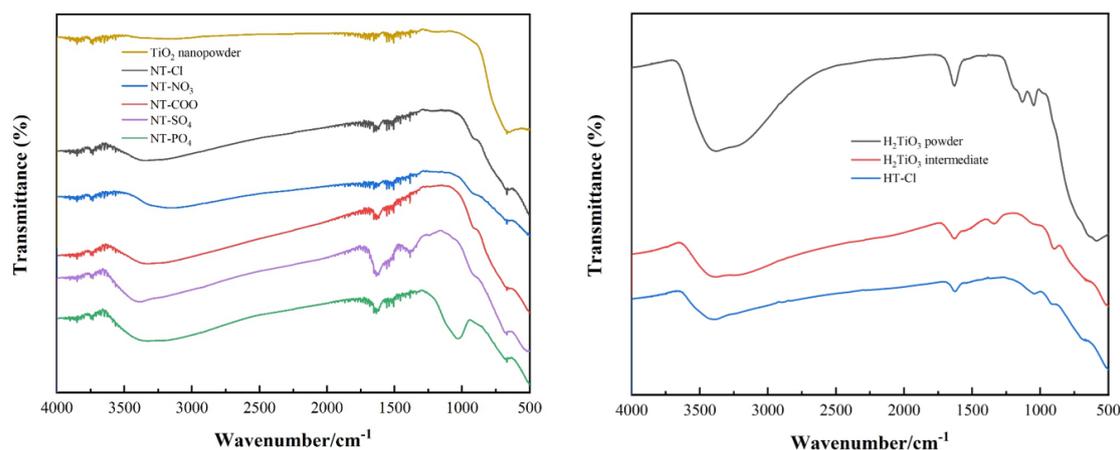
Fig. S1 FT-IR spectra of samples

Several precursors and catalysts were identified by FT-IR analysis, and the corresponding FT-IR spectra are depicted in Fig. S1. The FT-IR spectra of the six acid catalysts were similar. The TiO_2 nanopowder and H_2TiO_3 powder without acid treatment showed peaks between 500 and 880 cm^{-1}, indicating the vibration and adsorption of the Ti–O bond and O–Ti–O bond in titanium dioxide anatase. For NT-PO$_4$, it has been discovered that the primary peak of the Ti-O-Ti linkage shifts to 1032 cm^{-1}. Broad spectrum was seen between 3100 and 3536 cm^{-1} in the case of the activation utilizing several acids, which can be attributed to hydroxyl group stretching; these peaks essentially have no impact on the reaction[1]. All acids-treated catalysts exhibit a sharp peak between 1612 and 1651 cm^{-1}, varying according to the type of acid used. The observed peaks represent the H-O-H bending mode and the O-H bending of water adsorbed on the surface of titanium dioxide, indicating the hydrogenation and protonation of TiO_2 particles during acid activation[1]. It appears that acid activation for precursors is indeed responsible for promoting hydroxyl groups (Bronsted acidic sites) as supported by FTIR analysis.
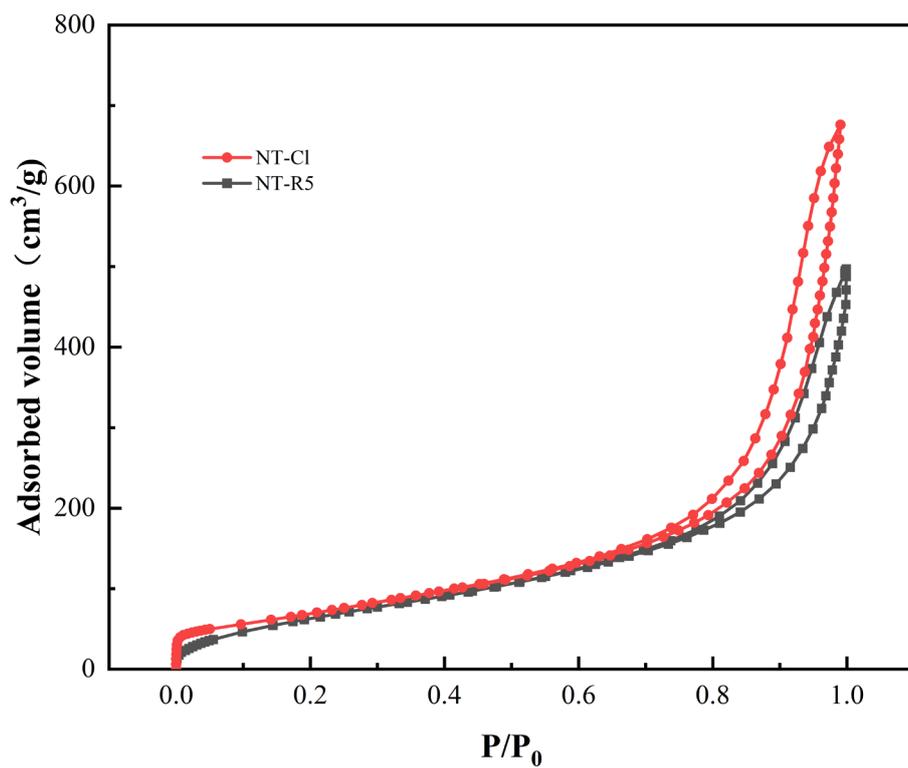
Fig. S2 N_2 adsorption-desorption isotherms of fresh catalyst and regeneration catalyst.
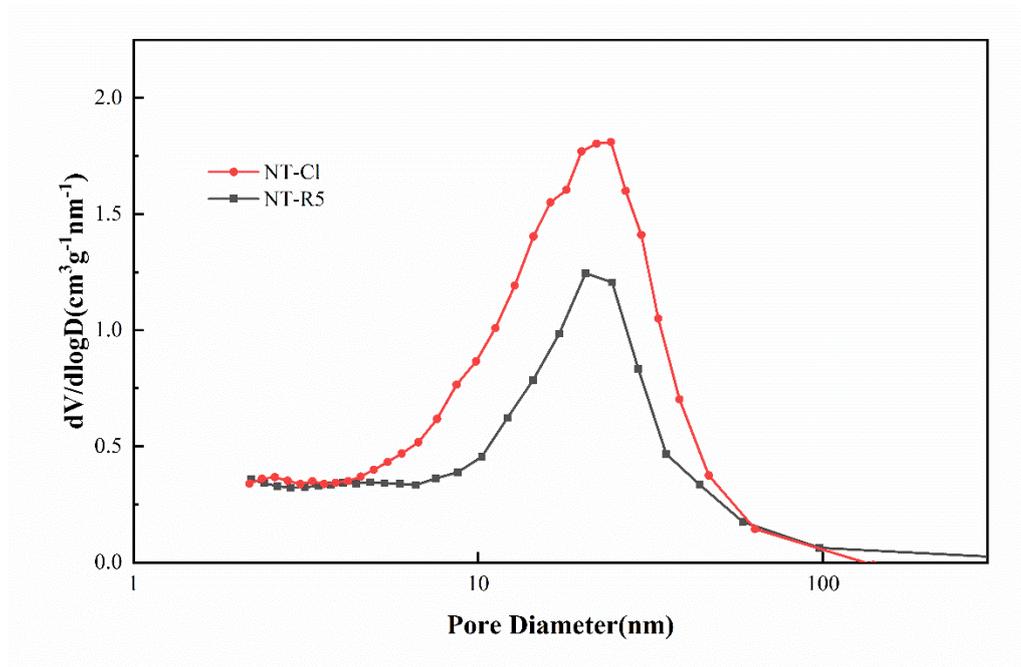
Fig. S3 The corresponding pore size distributions of fresh catalyst and regeneration
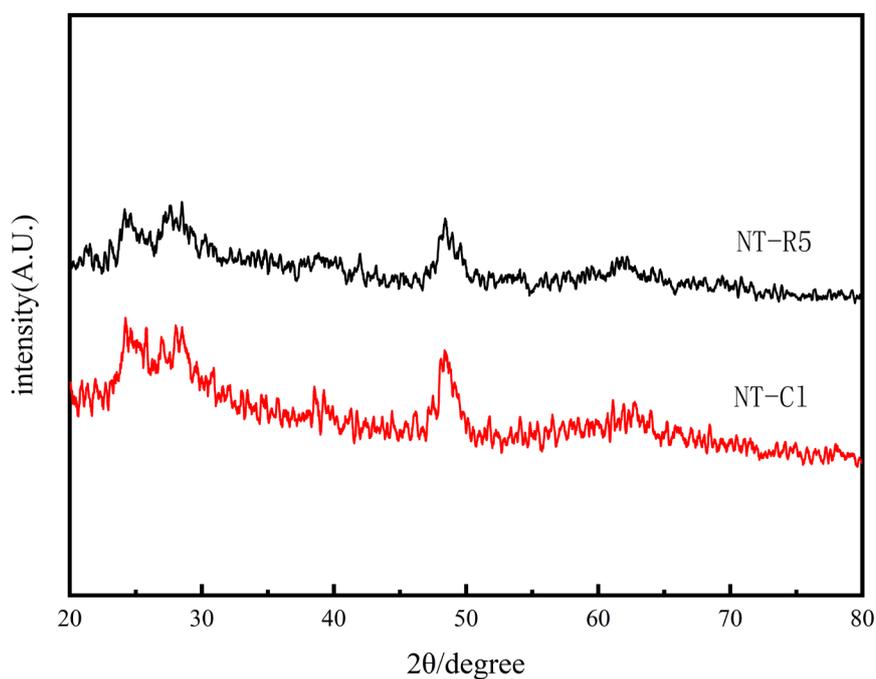
catalyst.

Fig. S4 XRD patterns of fresh catalyst and regeneration catalyst.

Table. S1 BET analysis of fresh catalyst and regeneration catalyst

Prepared samples	S_{BET} （m²/g）	S_{meso} （m²/g）	V_{total} （cm³/g）	PD （nm）
NT-Cl	314.4	314.4	0.834	15.5
Regeneration Catalyst	247.0	247.0	0.753	11.2

REFERENCES

[1] Se-Keun, Park, Hyunho, Shin, Effect of HCl and H_2SO_4 treatment of TiO_2 powder on the photosensitized degradation of aqueous rhodamine B under visible light, Journal of Nanoscience & Nanotechnology, (2014).