

Supporting information

A $\text{TiO}_2/\text{Nb}_2\text{O}_5 \cdot n\text{H}_2\text{O}$ Heterojunction Catalyst for Conversion of Glucose into

5-Hydroxymethylfurfural in Water

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Estimation of the water content in $\text{TiO}_2/\text{Nb}_2\text{O}_5 \cdot n\text{H}_2\text{O}$ (0.68)

According to the weight proportion of chemical bonding water in $\text{TiO}_2/\text{Nb}_2\text{O}_5 \cdot n\text{H}_2\text{O}$ (0.68) and the molar ratio of Ti:Nb, the value of n in $\text{TiO}_2/\text{Nb}_2\text{O}_5 \cdot n\text{H}_2\text{O}$ (0.68) is calculated from:

$$M(\text{TiO}_2) / (m(\text{TiO}_2) + m(\text{Nb}_2\text{O}_5) + m(n\text{H}_2\text{O})) = 25\%$$

$$M(\text{TiO}_2) / (M(\text{TiO}_2) + 1.48 M(\text{Nb}_2\text{O}_5) + 1.48 M(n\text{H}_2\text{O})) = 25\%$$

$$80 / (80 + 1.48 * 265.8 + 1.48n * 18) = 25\%$$

$$n = 6$$

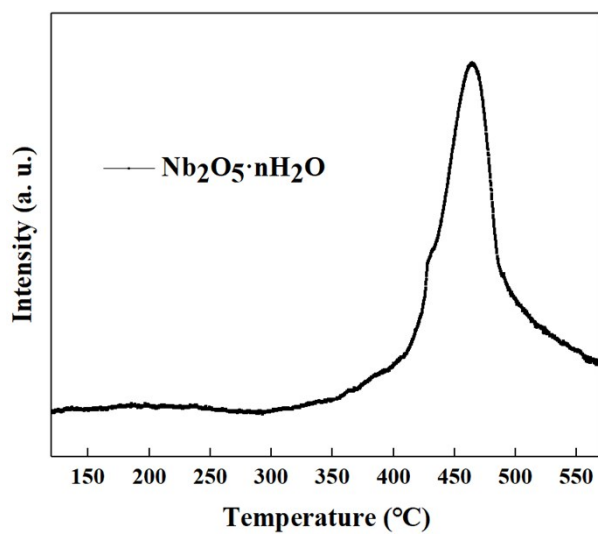


Figure S1. NH_3 -TPD spectrum of $\text{Nb}_2\text{O}_5 \cdot n\text{H}_2\text{O}$

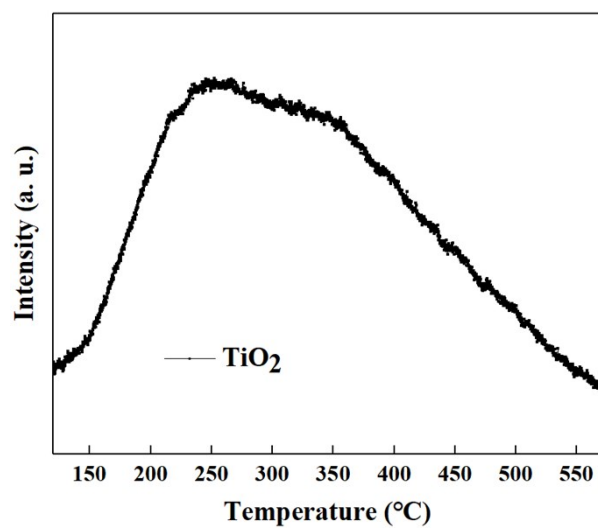


Figure S2. NH₃-TPD spectrum of TiO₂

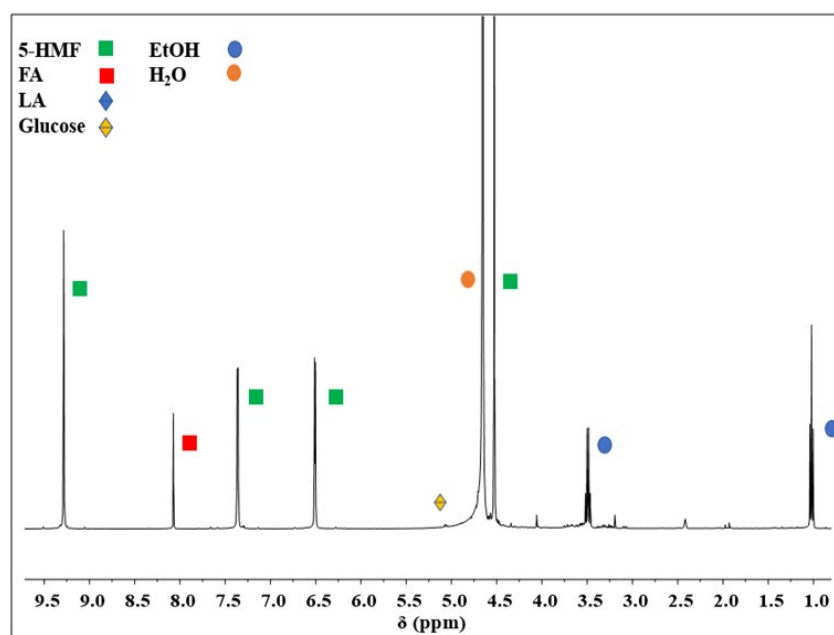


Figure S3. ¹H NMR spectrum (in D₂O) of the glucose solution (5.0% (w/w)) catalyzed by TiO₂/Nb₂O₅·nH₂O (0.68) under 150 °C for 300 min (ethanol was used as internal standard, 0.03 M).

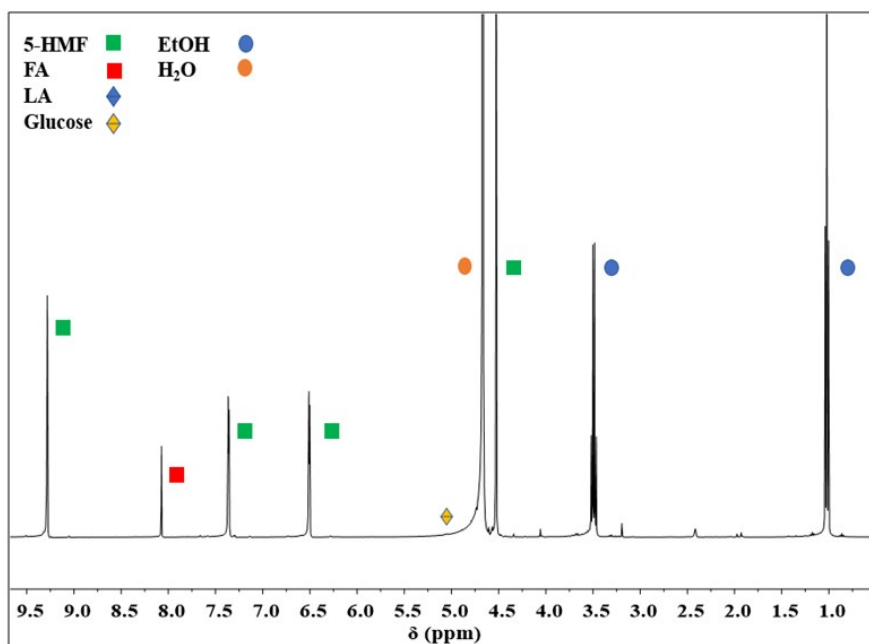


Figure S4. ¹H NMR spectrum (in D₂O) of the cellobiose solution (5.0% (w/w)) catalyzed by TiO₂/Nb₂O₅·nH₂O (0.68) under 150 °C for 300 min (ethanol was used as internal standard, 0.08 M).

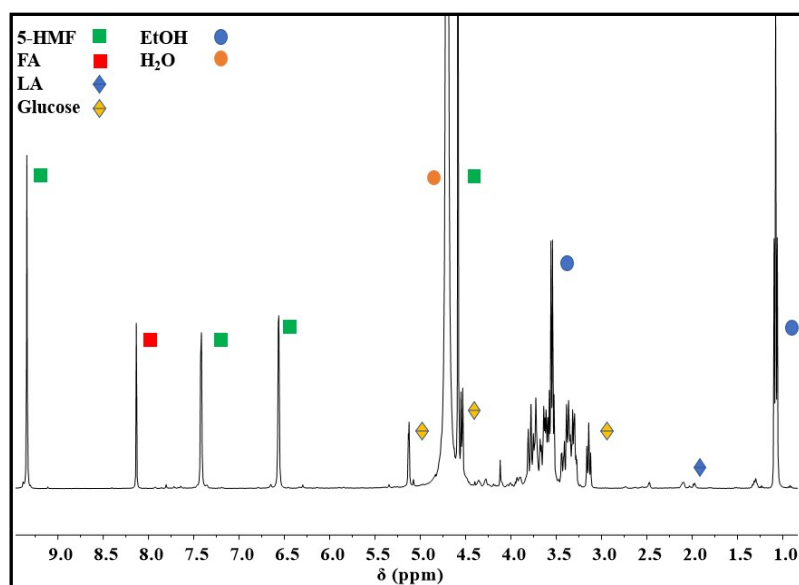


Figure S5. ¹H NMR spectrum (in D₂O) of the starch solution (5.0% (w/w)) catalyzed by TiO₂/Nb₂O₅·nH₂O (0.68) under 150 °C for 300 min (ethanol was used as internal standard, 0.067 M).

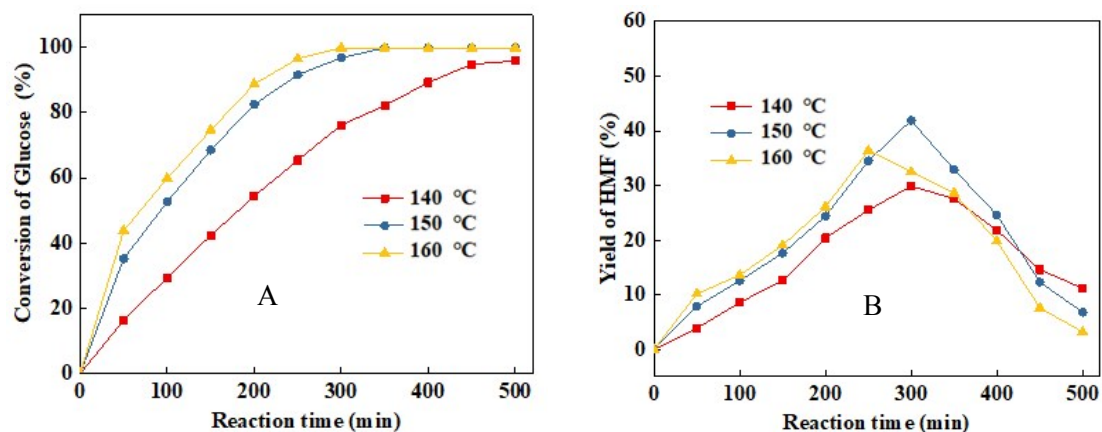


Figure S6. Variation of glucose conversion (A) and HMF formation (B) with time. Conditions: $\text{TiO}_2/\text{Nb}_2\text{O}_5 \cdot n\text{H}_2\text{O}$ (0.68), 15 mg, aqueous glucose solution (5.0% (w/w)), 1.5 mL.

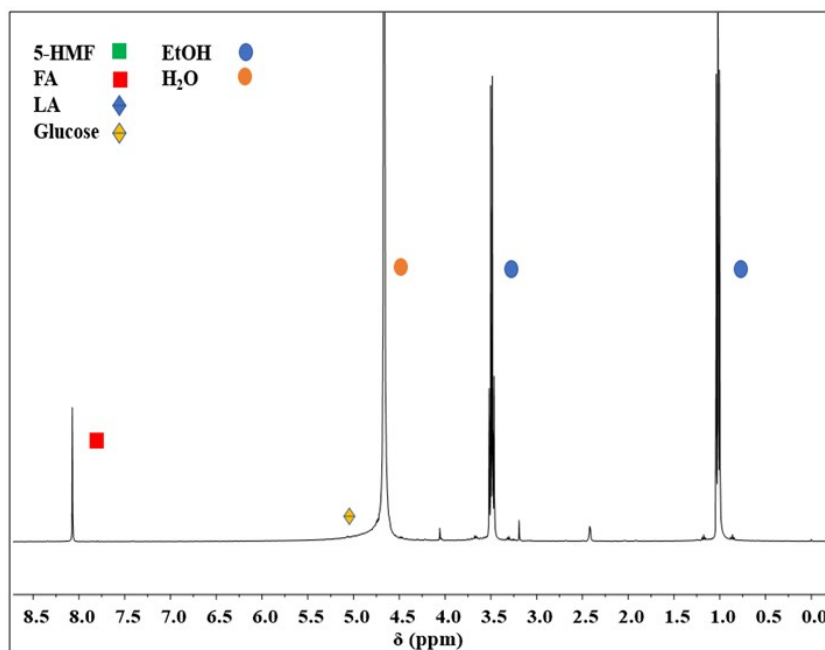


Figure S7. ^1H NMR spectrum (in D_2O) of the glucose solution (5.0% (w/w)) catalyzed by $\text{TiO}_2/\text{Nb}_2\text{O}_5 \cdot n\text{H}_2\text{O}$ (0.68) under 150 °C for 500 min (ethanol was used as internal standard, 0.08 M).

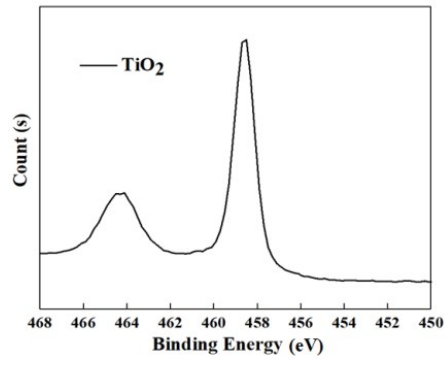


Figure S8. XPS of TiO₂.

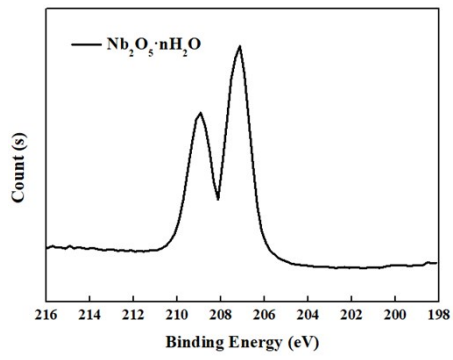


Figure S9. XPS of Nb₂O₅·nH₂O.