Electronic supplementary information

TiO_2-supported catalysts with ZnO and ZrO_2 for non-oxidative dehydrogenation of propane: mechanistic analysis and application potential

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Table S1 Results of NH_3-TPD tests.

Catalyst	T, ^oC			Acidic density, $\mu mol \cdot m^{-2}$		
	1st	2nd	3rd	1st	2nd	3rd
TiO_2	288	369	458	0.15	0.42	0.29
Ti-HT	344	414	515	0.27	0.47	0.29
0.5ZnTi	271	349	442	0.098	0.28	0.24
1ZnTi	263	335	436	0.064	0.23	0.33
2ZnTi	274	350	463	0.25	0.59	0.51
4ZnTi	283	354	459	0.22	0.56	0.53
2ZrTi	341	410	494	0.26	0.48	0.32
0.5Zn1.4ZrTi	312	386	483	0.24	0.55	0.37
1Zn1.4ZrTi	265	340	444	0.23	0.61	0.49
2Zn1.4ZrTi	296	375	487	0.23	0.57	0.49
4Zn1.4ZrTi	285	359	469	0.23	0.53	0.50
6Zn1.4ZrTi	309	373	476	0.13	0.36	0.45
10Zn1.4ZrTi	329	394	501	0.094	0.27	0.34
2Zn2.8ZrTi	320	400	525	0.22	0.65	0.63
2Zn5.6ZrTi	263	332	439	0.15	0.45	0.64

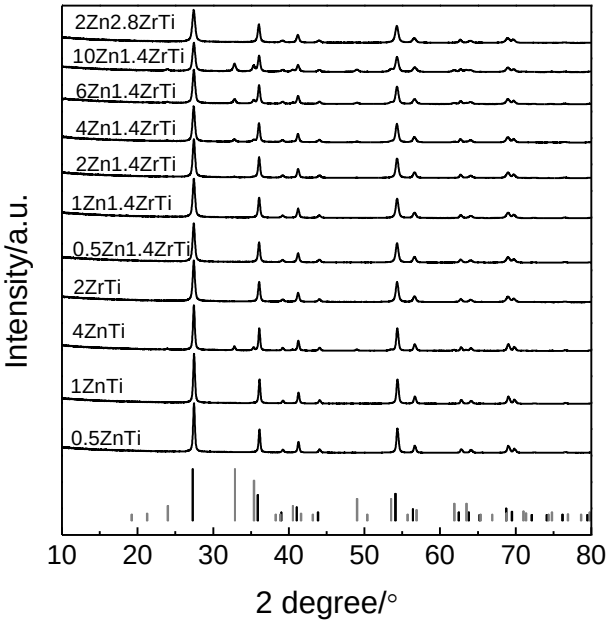

Figure S1. XRD patterns of as-prepared catalysts. Black and light grey bars are related to rutile (PDF 00-021-1276) and rhombohedral $ZnTiO_3$ (PDF 00-26-1500), respectively.

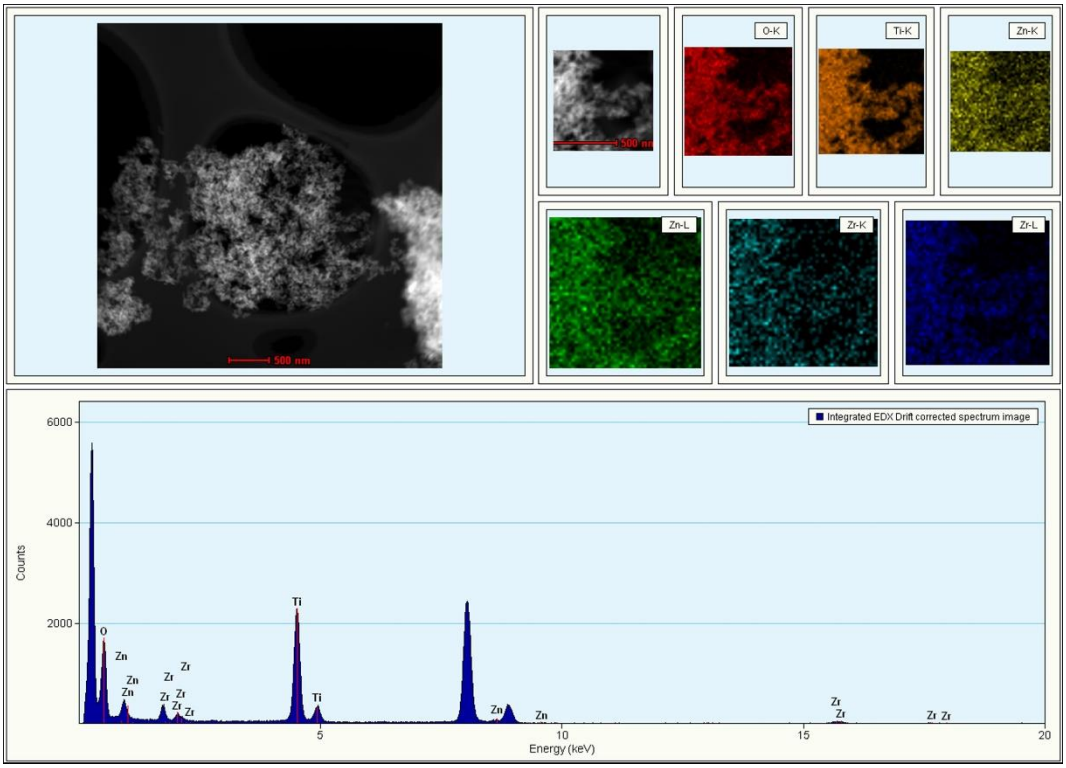

Figure S2. Energy dispersive X-ray element mapping images of 2Zn5.6ZrTi.

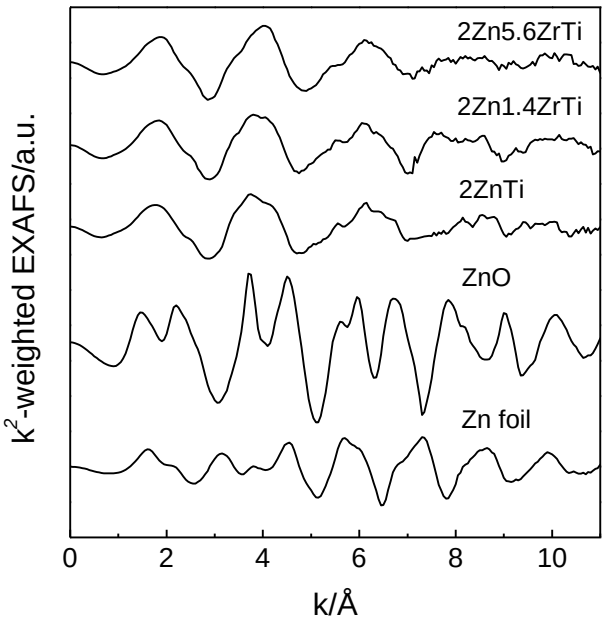

Figure S3. The raw k^2-weighted EXAFS data of the as-prepared catalyst and reference materials.

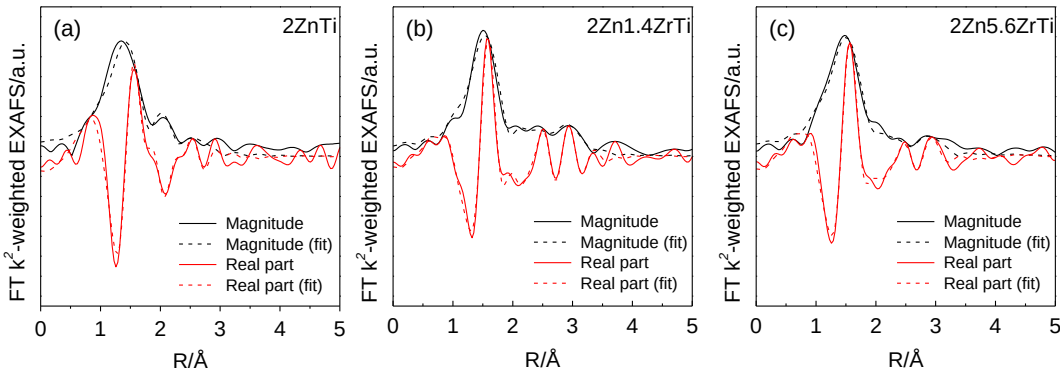

Figure S4. EXAFS fittings of (a) 2ZnTi, (b) 2Zn1.4ZrTi, and (c) 2Zn5.6ZrTi

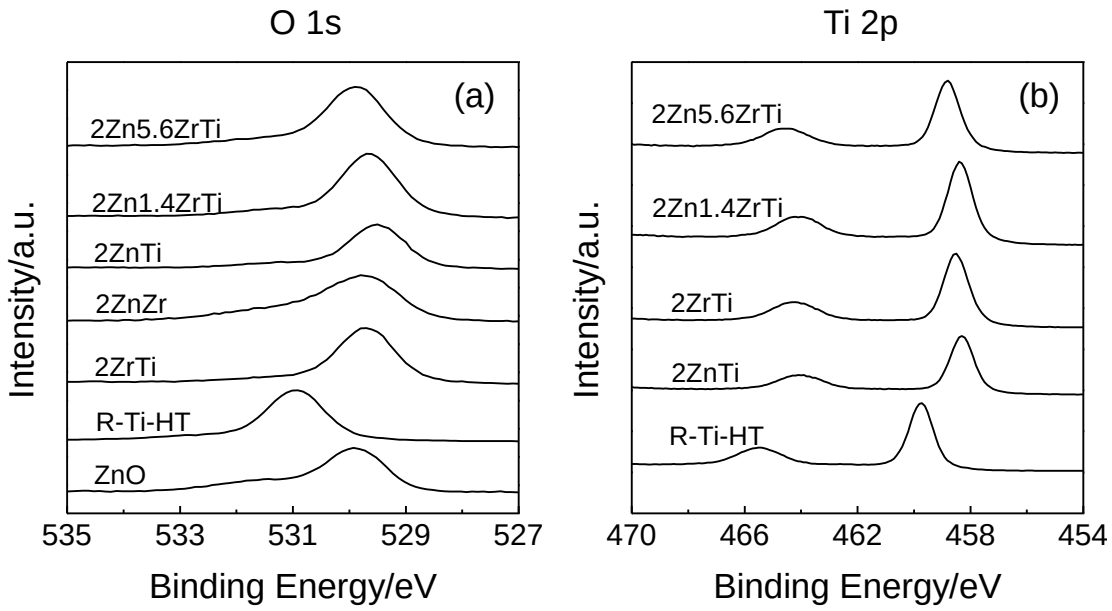

Figure S5 XP spectra of (a) O 1s and (b) Ti 2p of selected samples.

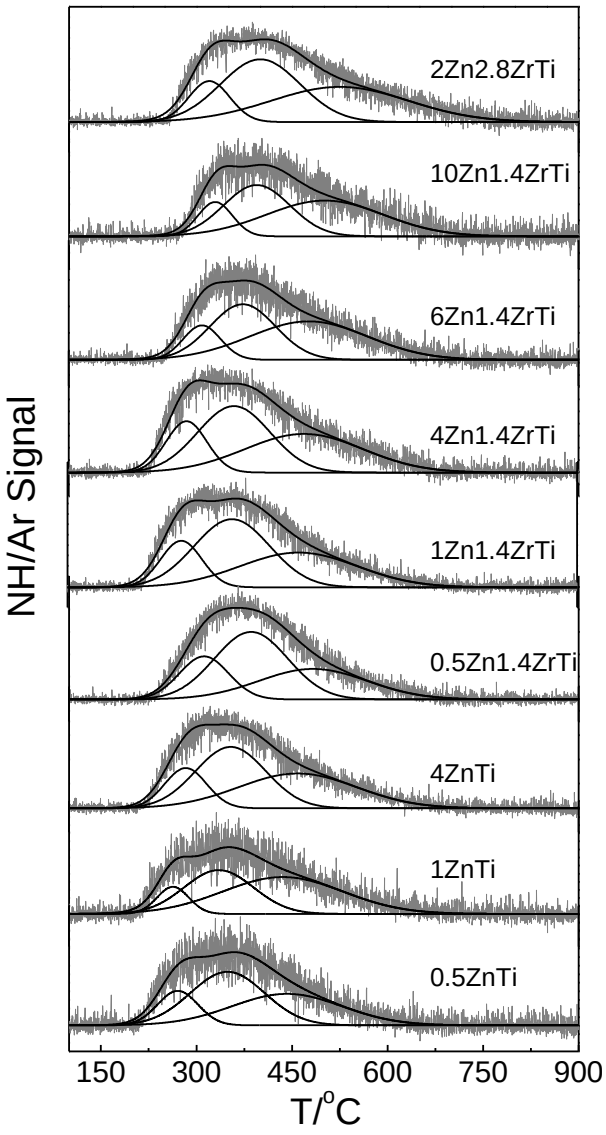

Figure S6. Gaussian fittings of NH_3-TPD profiles of reduced catalysts.

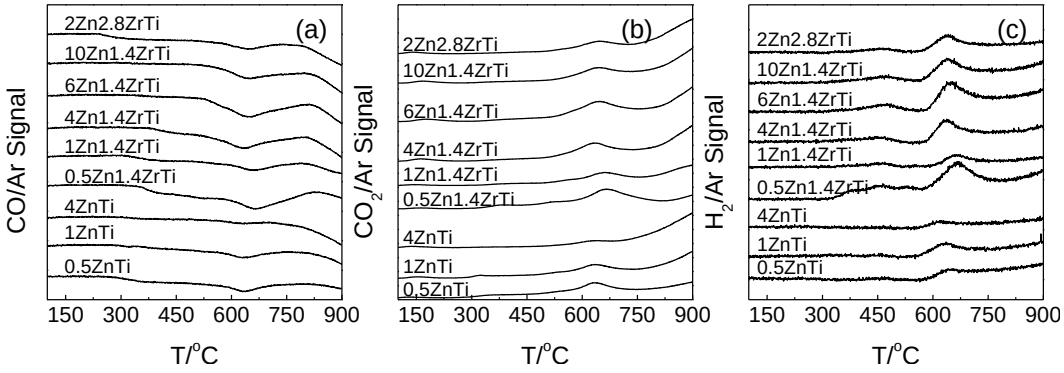

Figure S7. CO-TPR profiles of as-prepared catalysts in terms of (a) CO/Ar, (b) CO_2/Ar and (c) H_2/Ar signal.

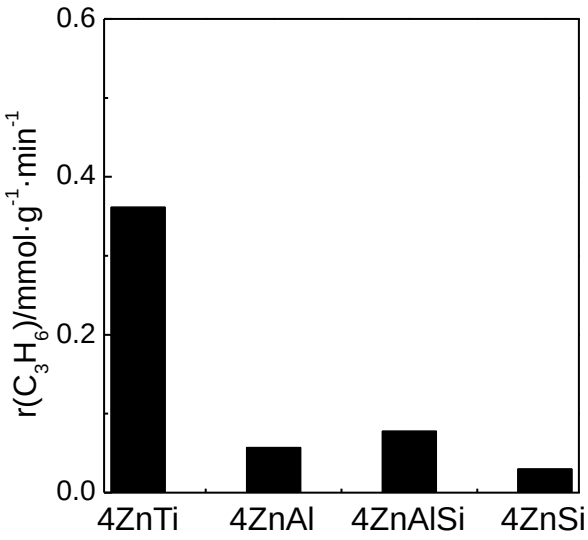

Figure S8. Propene formation rate over ZnO catalysts with different kinds of supports.

The loading amount of Zn is 4 wt%.

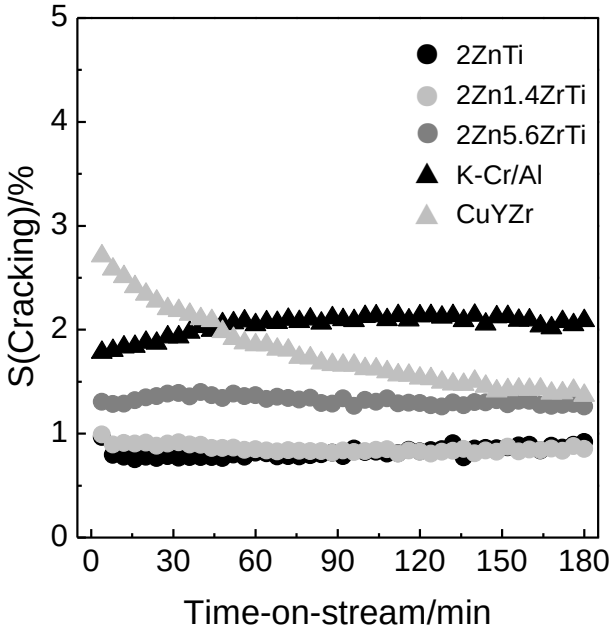

Figure S9. Selectivity to cracking (CH_4, C_2H_4 and C_2H_6) over 2ZnTi, 2Zn1.4ZrTi and 2Zn5.6ZrTi, commercial-like K-Cr/Al and CuYZr against propane on-stream.

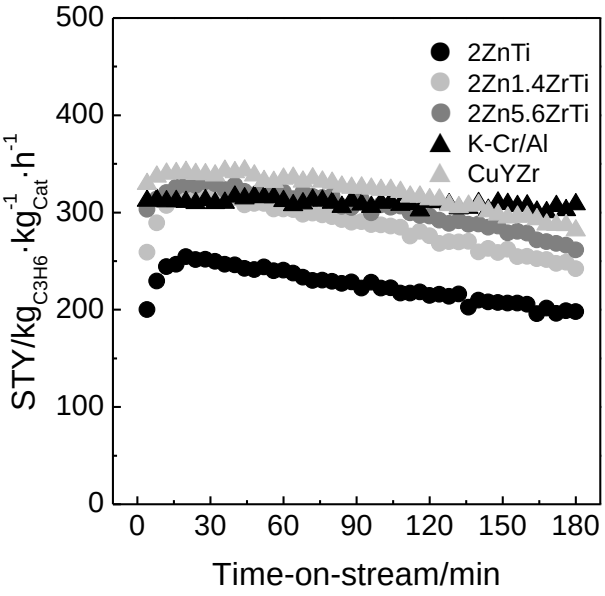

Figure S10. STY profiles over 2ZnTi, 2Zn1.4ZrTi, 2Zn5.6ZrTi, commercial-like K-Cr/Al and CuYZr.

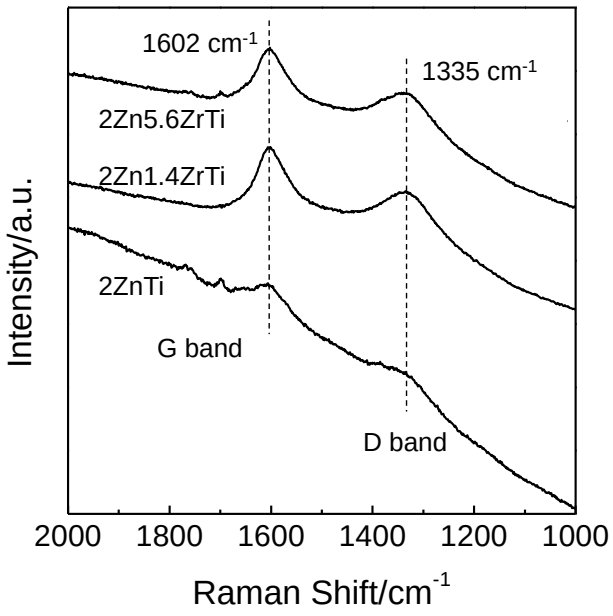

Figure S11. Ex-situ Raman spectra of spent catalysts.