

Supplementary Information

Table S1: Surface area results of used catalysts

Catalyst	BET surface area (m²/g)
UsedPtSn-N2	111.0
UsedPtSn-SA	153.9
UsedPtSn-FA	136.1
UsedPtSnZnCa-N2	180.6
UsedPtSnZnCa-SA	141.3
UsedPtSnZnCa-FA	173.8

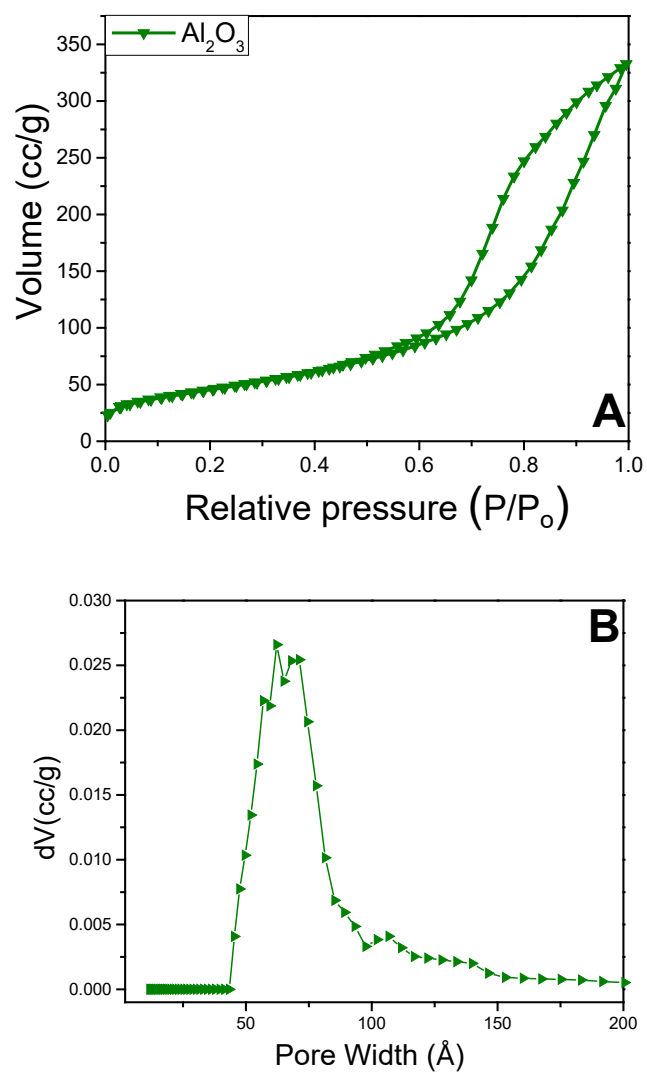


Figure S1. (A) Nitrogen adsorption-desorption isotherms, (B) Pore-size distribution of calcined Al_2O_3 support

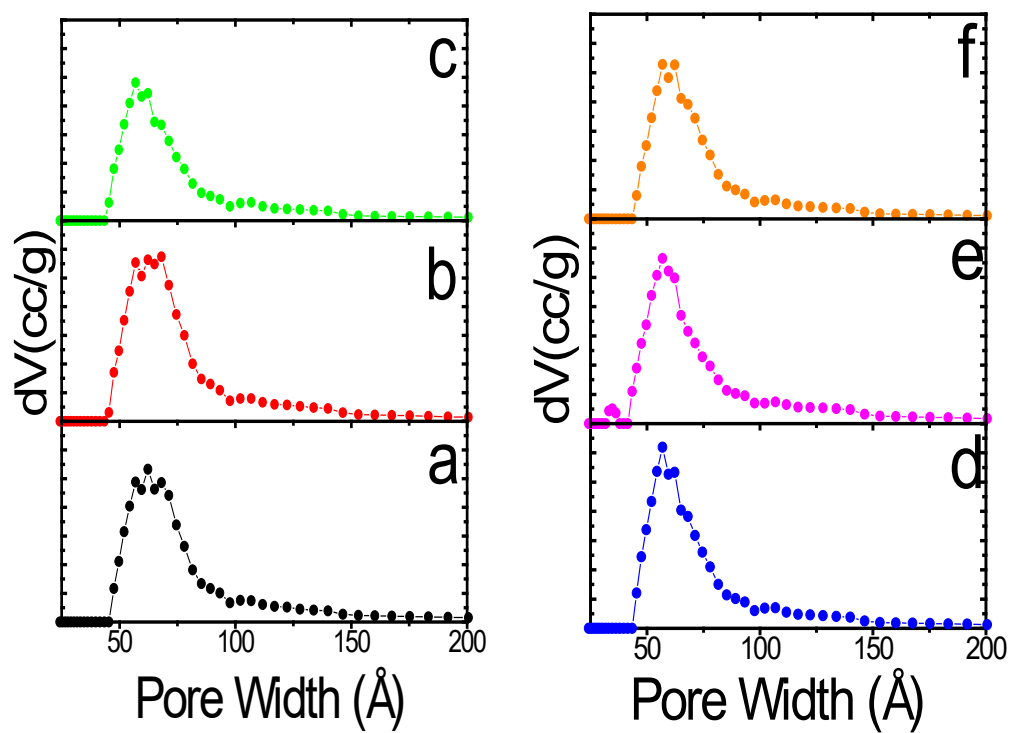


Figure S2. Pore size distribution curves of the calcined catalysts: a. PtSn-FA, b. PtSn-N₂, c. PtSn-SA, d. PtSnZnCa-FA, e. PtSnZnCa-N₂, f. PtSnZnCa-SA.

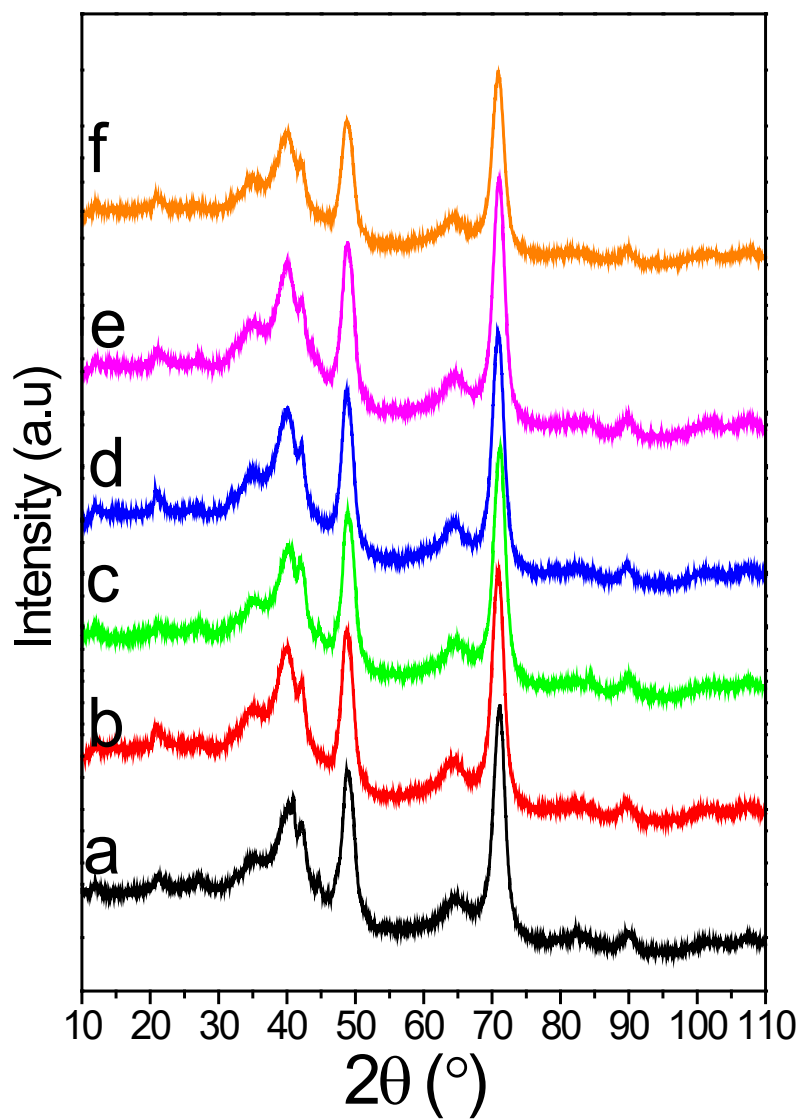


Figure S3. X-ray diffraction patterns of used catalysts: a. PtSn-FA, b. PtSn-N₂, c. PtSn-SA, d. PtSnZnCa-FA, e. PtSnZnCa-N₂, f. PtSnZnCa-SA.

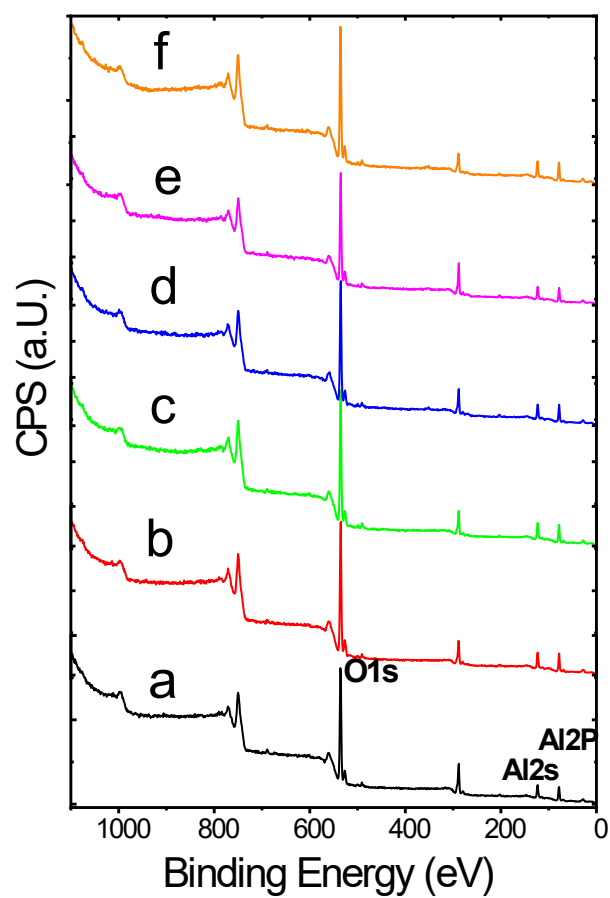


Figure S4. XPS survey spectra of all calcined catalysts: a. PtSn-FA, b. PtSn-N₂, c. PtSn-SA, d. PtSnZnCa-FA, e. PtSnZnCa-N₂, f. PtSnZnCa-SA

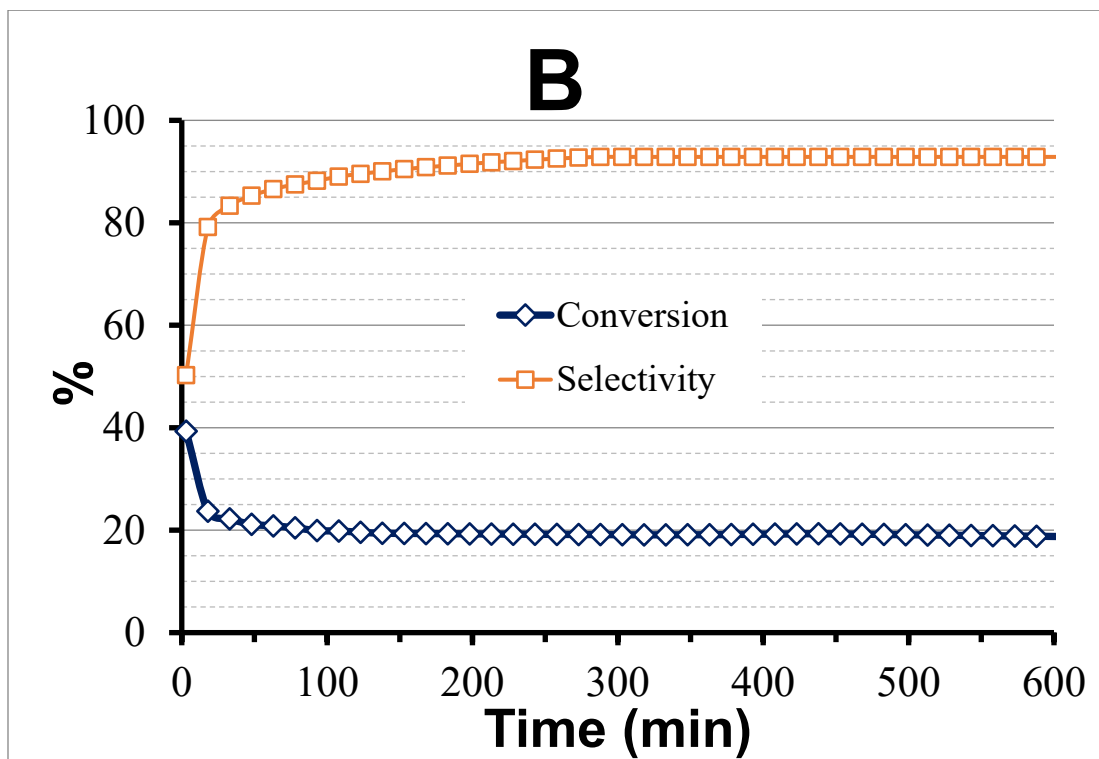
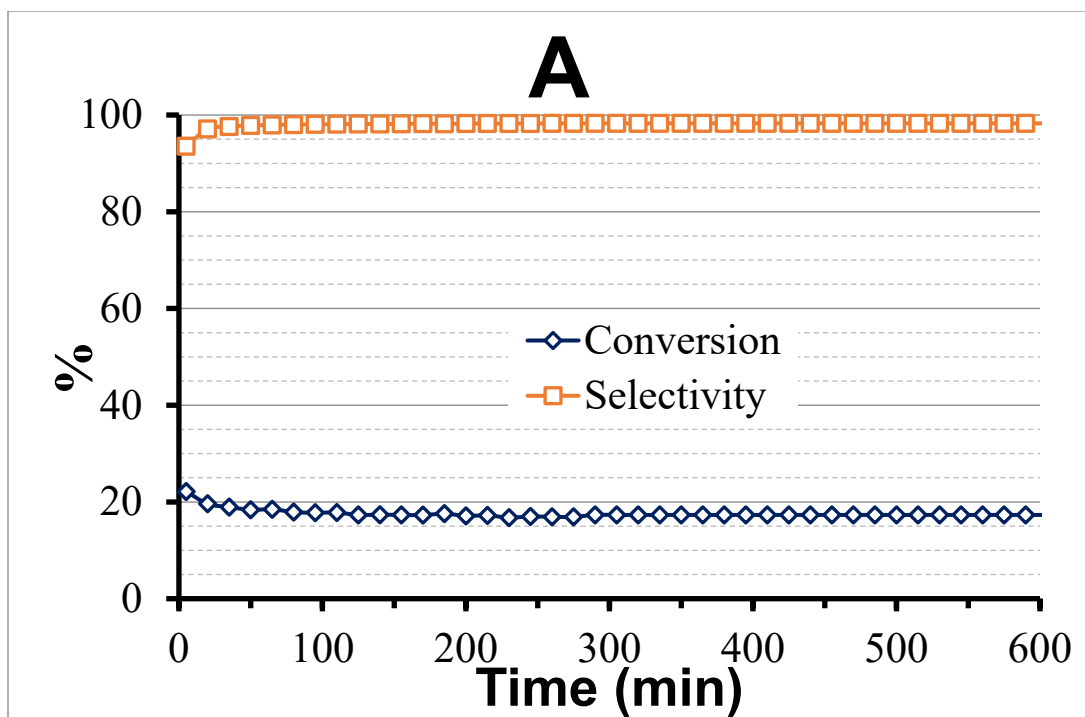


Figure S5. Activity results for ethane dehydrogenation at 625°C: (A) PtSnZn-SA (B)PtSnCa-SA.