Electronic supplementary information

Facile synthesis of bio-fuel from glycerol over zinc aluminium phosphate nano plates

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1. Experimental details

1.1. Catalyst characterization

The Scanning Electron Microscope (SEM) images were recorded for obtaining particle morphology on JEOL JSM-7900F instrument Japan. Transmission Electron Microscopy (TEM) images were recorded on JEOL, JSM-2100F instrument, Japan. X-ray powder diffraction (XRD) patterns were measured on PANalytical Xpert PRO instrument, USA equipped with rotating anode and CuK α radiations. The measurements were conducted in continuous $\theta/2\theta$ scan refraction mode. The anode was operated at 30 KV and 15 mA the 2 θ angles were measured 5°–75° at the rate of 2°/min. The Fourier transform infrared spectroscopy (FTIR) spectra of the samples were recorded on Perkin Elmer- spectrum two, USA.

The acidity of the catalysts was measured by temperature programmed desorption of NH_3 (NH_3 -TPD) using a Micromeritics chemisorbs 2750 chemisorption system, where 0.1g sample was used for each TPD experiment. Prior to the TPD measurements the

catalyst sample was dehydrated at 500°C in helium gas (30cm³ min⁻¹) for 1h. The temperature was decreased to 100°C and the sample was allowed to adsorb NH₃ by exposing sample treated in this manner to a stream containing 10% NH₃ in helium for 1h at 100°C. The ammonia treated sample was then flushed with helium for another 1h to remove physicosorbed NH₃. The chemically adsorbed ammonia is quantitatively measured by heating-based temperature programmed desorption of NH₃ that was conducted in the flow of helium gas (30cm³ min⁻¹) by increasing the temperature up to 950°C at 10°C min⁻¹ heating rate. The desorbed ammonia with respect to the temperature has been measured using TCD detector. The thermal stability of the ZAPNP-1 and ZAPNP-2 samples was also confirmed from the TGA analysis (Perkin Elmer TGA 4000, USA).

X-ray Photoelectron Spectroscopy (XPS) analysis was performed with a Kratos AXIS Ultra DLD apparatus, equipped with monochromated Al K α radiation X-ray source, a charge neutralizer and a hemispherical electron energy analyser. During data acquisition, the chamber pressure was kept below 10⁻⁹ mbar. The spectra were analysed using the CasaXPS software pack and corrected for charging using C 1s binding energy (BE) as the reference at 284.8 eV. ICP analysis is also used for the metal composition.

Supporting Figures



Fig. S1 XPS spectra of the ZAPNP-1 and ZAPNP-2 samples



Fig. S2 SEM EDAX of ZAPNP -1 and ZAPNP-2 samples



Fig. S3 Selected Area electron diffraction (SAED) ZAPNP -1 and ZAPNP-2 samples



Fig. S4 Thermo gravimetric properties of ZAPNP-1 and ZAPNP-2 samples



Fig. S5SEM images of fresh ZAPNP-1 and ZAPNP-2 (a, c) and after 5 reaction cycle
of ZAPNP-1 and ZAPNP-2 samples (b, d)



Fig. S6 TEM images of fresh ZAPNP-1 and ZAPNP-2 (a, c) and after 5 reaction cycle of ZAPNP-1 and ZAPNP-2 samples (b, d)



Fig. S7 Confirming the heterogonous nature of catalysts by hot filtration

Elements	ZAPNP-1			ZAPNP-2		
	Fresh (wt%)	Leached (wt%)	% of fresh catalyst leached	Fresh (wt%)	Leached (wt%)	% of fresh catalyst leached
Zn	2.26	0.00	0.00	2.47	0.01	0.41
Al	9.48	0.00	0.00	8.68	0.00	0.00
Р	31.02	0.01	0.03	32.22	0.02	0.06

Table : S1ICP analysis of fresh and leached sample of ZAPNP-1 and ZAPNP-2 samples