**Electronic supplementary information**

# Room temparature Synthesis of $ZnAlPO_4$ nano particles and their catalytic applications

Peta Sreenivasulu[a], Devaki Nandan[a], B. Sreedhar[b] and Nagabhatla Viswanadham[a]

[a]Catalysis and Conversion Processes Division, Indian Institute of Petroleum, Council of Scientific and Industrial Research, Dehradun-248005, India. [b]Indian Institute of Chemical Technology

E-mail: nvish@iip.res.in

Tel: 91-135-2525856, Fax: 91-135-2525702

## 1. Experimental Details:

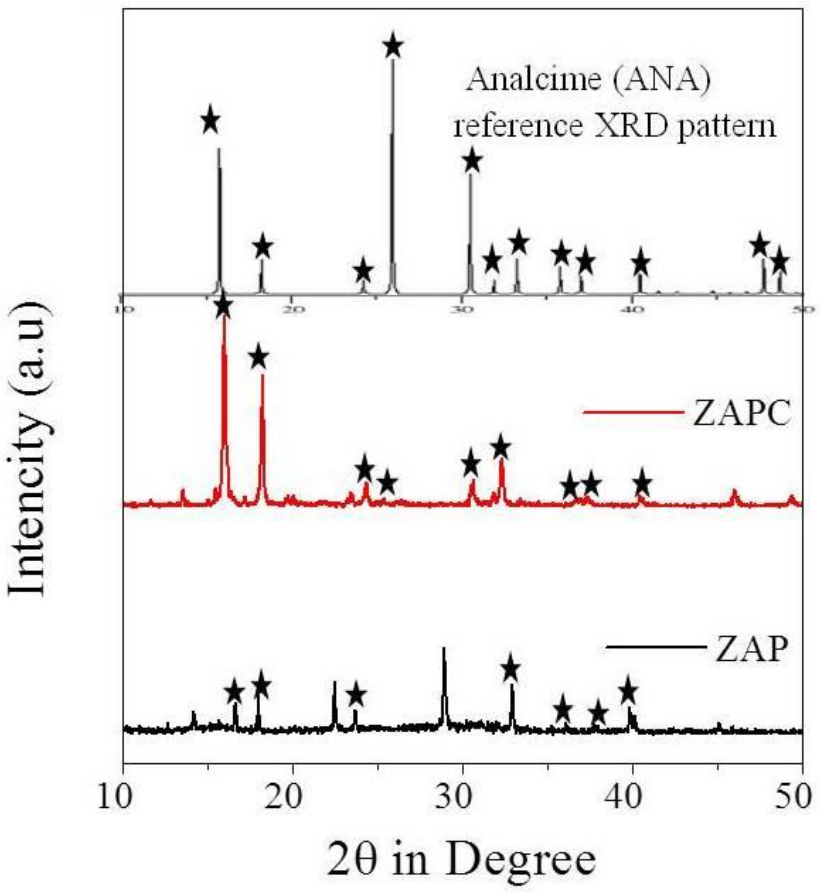
Typical synthesis method involves the dispersion of aluminum nitrate and zinc nitrate powders in a solution of ammonium orthophosphate with vigorous stirring at room temperature, followed by the sequential addition of tetra propyl ammonium bromide and hydrofluoric acid, leaving the resultant mixture under stirring one hour to obtain a homogeneous gel with an overall molar composition of $0.1Al_2O_3$:0.011Zn: $0.35P_2O_5$: 0.0016 SDA: 0.1HF:3H2O. The crystallization is carried out at room temperature by adding a few drops of ammonia and the white crystals obtained were filtered and washed with copious amount of de-ionized water and dried at room temperature overnight, followed by calcinations for 5 h at 500 °C. The samples obtained before and after calcination are denoted as ZAP and ZAPC respectively.

### 1.1 Characterization:

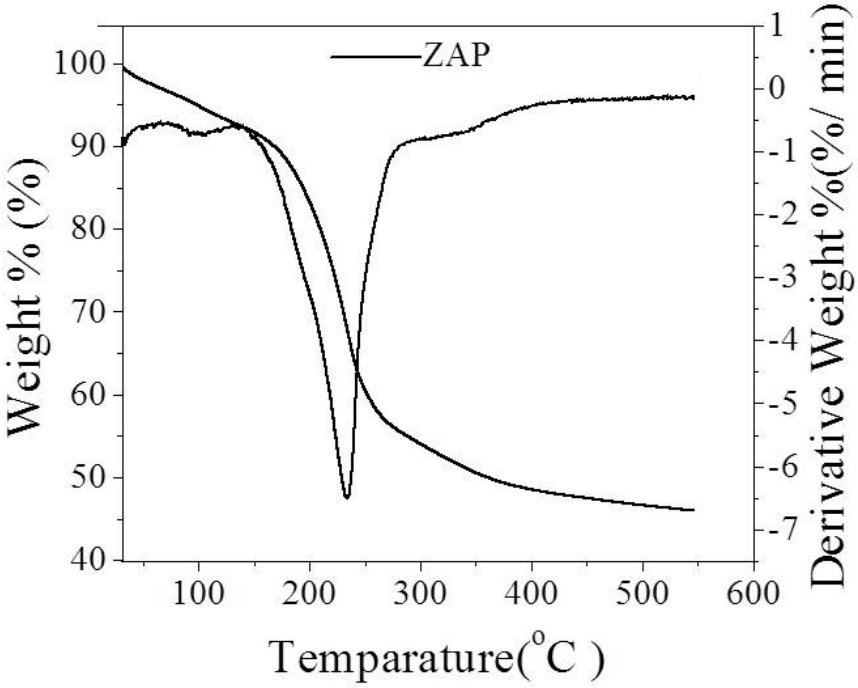
Powder X-ray diffraction patterns of the samples were recorded on a Regaku Dmax III B equipped with rotating anode and CuKα radiations. SEM images were recorded for obtaining particle morphology on Quanta 200f instrument, Netherland. The IR spectra of the both samples were recorded on Thermonicolate 8700 instrument, Thermoscientific Corporation, USA.

**1.2 Reaction :** The alkylation reaction was carried out in round bottom flask at reflux condition with constant cold water flow and costant stirring. In a typical reaction study, 2 mmol benzyl alcohol, 0.5 g of catalyst and 5ml acetonitrile are taken in round bottom flask followed by the addition of 1 mmol aetophenone in dropwise manner. The temperature then incereased up to 100 $^oC$ and this temperature was maintained for 4h. The reaction mass then cooled out up to room temperature then product was collected by filtration and analysed by GC-MS.

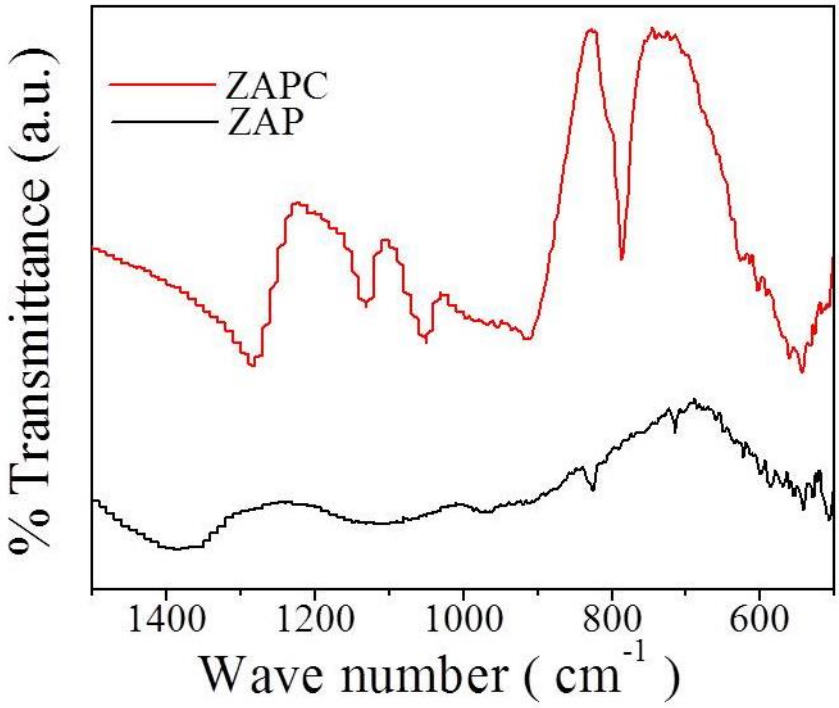
**Supporting Fig. 1: XRD pattern of $ZnAlPO_4$.**



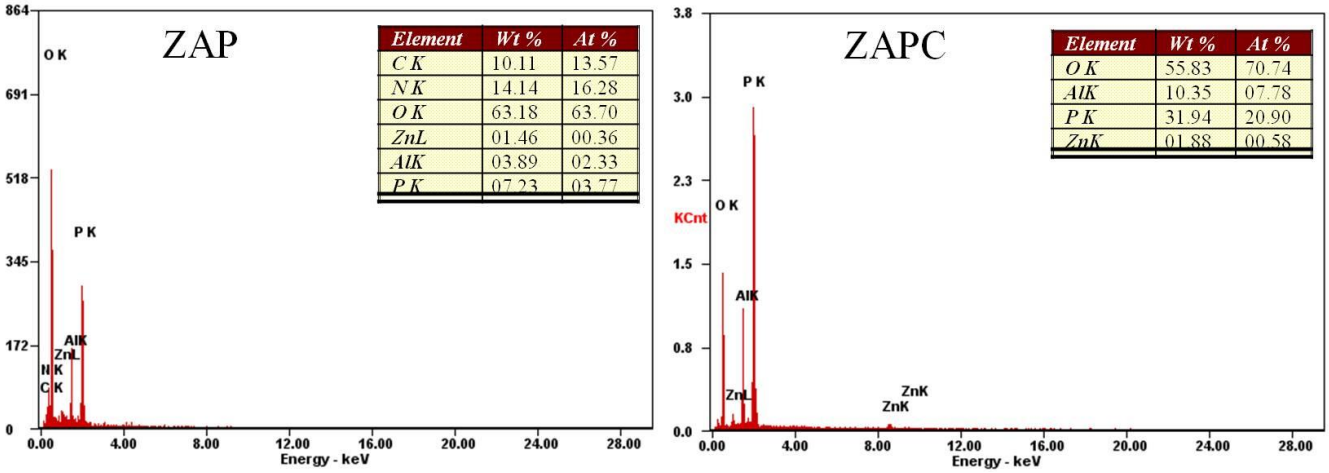

**Supporting Fig. 2:** TGA-DTA pattern of $ZnAlPO_4$.



**Supporting Fig. 3:** IR spectra of the $ZnAlPO_4$.



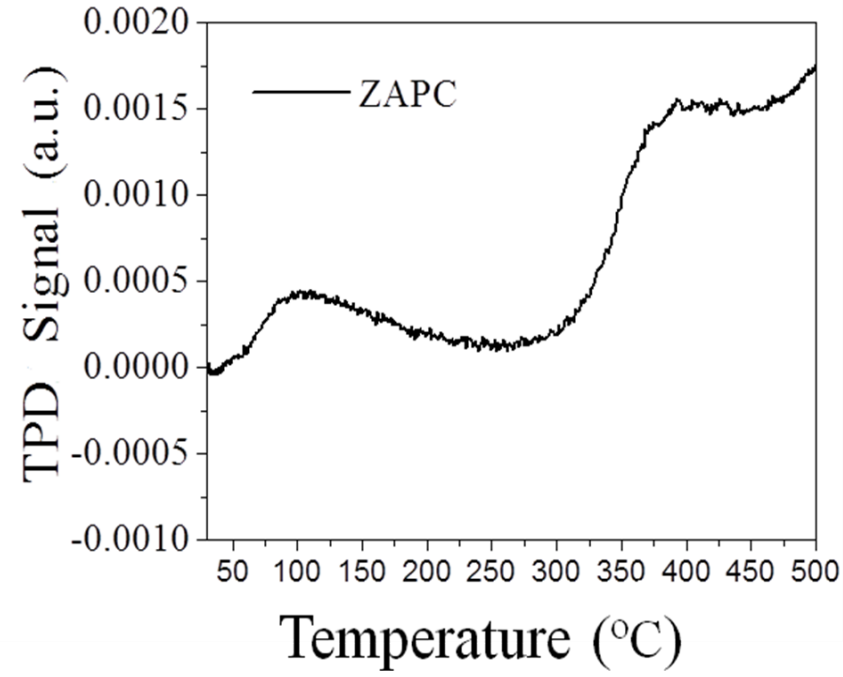

**Supporting Fig. 4**: EDX analysis of ZnAlPO4.




| Element | Wt % | At % |
|---|---|---|
| C K | 10.11 | 13.57 |
| N K | 14.14 | 16.28 |
| O K | 63.18 | 63.70 |
| Zn L | 01.46 | 00.36 |
| Al K | 03.89 | 02.33 |
| P K | 07.23 | 03.77 |

| Element | Wt % | At % |
|---|---|---|
| O K | 55.83 | 70.74 |
| Al K | 10.35 | 07.78 |
| P K | 31.94 | 20.90 |
| Zn K | 01.88 | 00.58 |

**Supporting Fig. 5** TPD spectra of the synthesized $ZnAlPO_4$.




**Supporting Table 1:** Various catalytic performances for acetophenone conversion.

| S.No | Catalyst | Acetophenone conversion (%) | Ref |
|---|---|---|---|
| 1 | NaX | 36.3 | S1 |
| 2 | NaY | 24.6 | |
| 3 | NaZSM-5 (40) | 67 | |
| 4 | KZSM-5 (40) | 89 | |
| 5 | CsZSM-5 (40)d | 91 | |
| 6 | HZSM-5 (30) | 76.6 | |
| 7 | Kβ | 76 | |
| 8 | ZAPC | 100 | This work |
| 9 | ZAPC(used catalyst) | 98 | This work |

S1) S. J. Kulkarni , G. Madhavi, A. Ramachander Rao, K. V. V. Krishna Mohan, *Catalysis Communications*, 2008, **9**, 532.