

**Supporting Information: Tuning the arrangement of atoms in SAPO-34 molecular sieves for a deeper understanding of their performance in MTO reaction**

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<sup>13</sup>C and <sup>31</sup>P MAS NMR spectroscopy

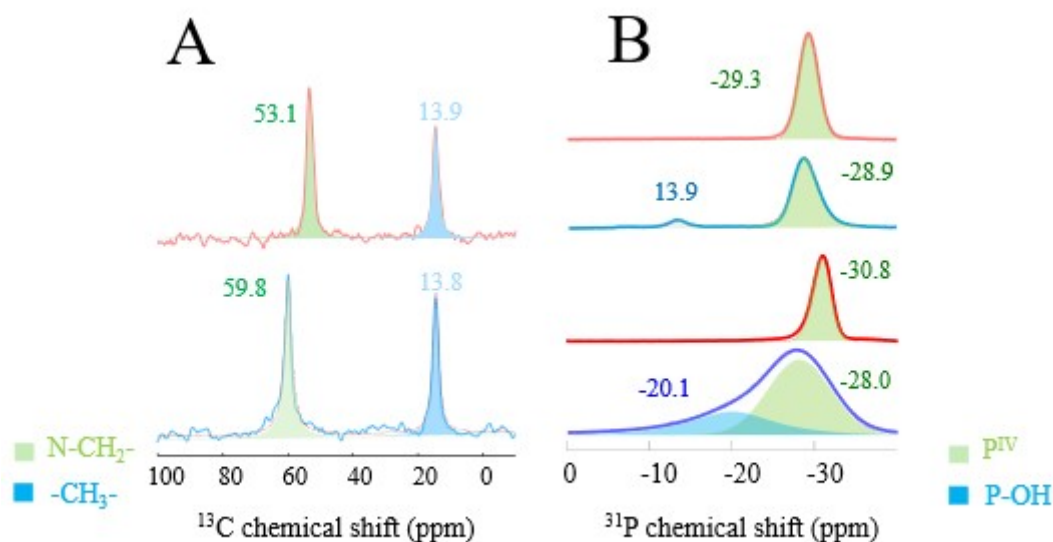


Fig. S1 (A) Solid-state <sup>13</sup>C MAS NMR spectra of N-AS (top, light red) and P-AS (bottom, light blue); (B) Solid-state <sup>31</sup>P MAS NMR spectra of N-AS (light red) and P-AS (light blue), N-C (red) and P-C (blue).

**Table S1** <sup>13</sup>C and <sup>31</sup>P relative percentage of N-AS, P-AS, N-C and P-C.

Sample	N-CH <sub>2</sub> -	CH <sub>3</sub> -	P <sup>IV</sup>	P-OH
N-AS	62	38	97	3
P-AS	53	47	92	8
N-C	-	-	100	-
P-C	-	-	55	45

## N<sub>2</sub> adsorption-desorption isotherms

The pore size distribution of N-C and P-C analysed using nitrogen sorption and evaluated through the Non-Local Density Functional Theory (NLDFT) model is shown in **Figure S1**.

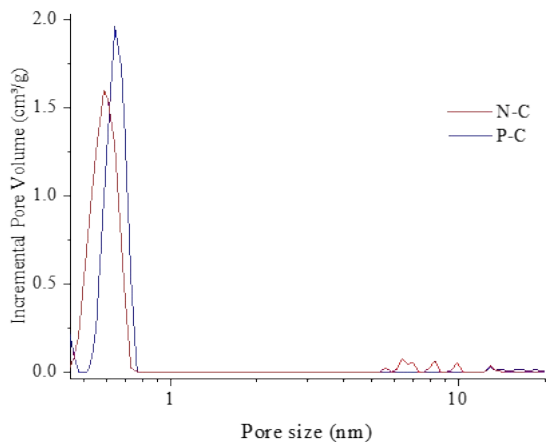


Fig. S2 Pore size distribution curves of N-C (red) and P-C (blue).

## Thermogravimetric analyses (TGA)

**Table S2** Weight loss and template molecules per cages of N-AS and P-AS.

Sample	Weight loss (wt%)			Molecules per cage
	I	II	III	
N-AS	4	10.0	2.9	1.6
P-AS	2	12.7	3.5	1.2

## FT-IR spectroscopy

FT-IR spectra of the -OH region normalized (**Fig. S3 A**) and the evolution of the -OH region during CD<sub>3</sub>CN adsorption is shown in **Fig. S3 B**.

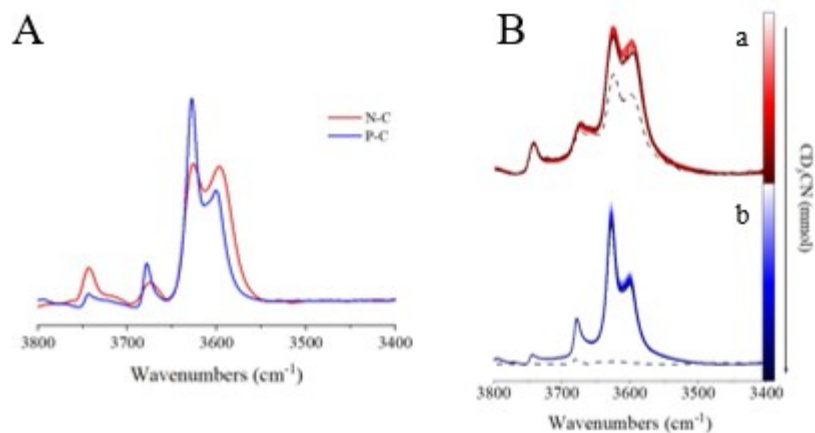


Fig. S3 (A) FT-IR spectra of the OH-stretching region and (B) evolution of the -OH region during CD<sub>3</sub>CN adsorption of N-C (a, red) and P-C (b, blue).

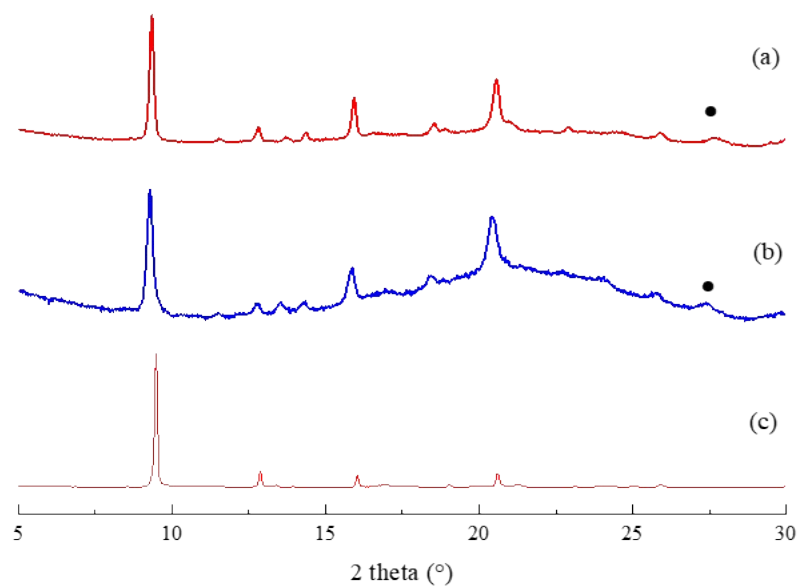


Fig. S4 XRD pattern after MTO reaction of N-C (a, red) and P-C (b, blue). Comparison with the fresh sample N-C (c). ● carbonaceous species.