

## Supplementary data

### Ionic liquid and lysine co-assisted synthesis of the highly dispersed Ni/SAPO-11 catalyst

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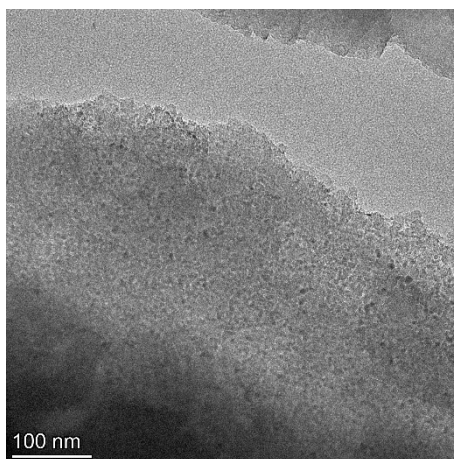
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Table S1. Textural parameters of SAPO-11, 4%Ni/SAPO-11, 4%Ni/SAPO-11-L, 4%Ni/SAPO-11-LZ

Sample	BET ( $\text{m}^2\text{g}^{-1}$ )	$S_{\text{Micro}}$ ( $\text{m}^2\text{g}^{-1}$ )	$V_{\text{Total}}$ ( $\text{cm}^3\text{g}^{-1}$ )	$V_{\text{Micro}}$ ( $\text{cm}^3\text{g}^{-1}$ )
SAPO-11	202	140	0.135	0.073
4%Ni/SAPO-11	119	95	0.086	0.05
4%Ni/SAPO-11-L	142	116	0.1	0.061
4%Ni/SAPO-11-LZ	125	101	0.118	0.053
4%Ni/SAPO-11-LLZ	155	125	0.12	0.066

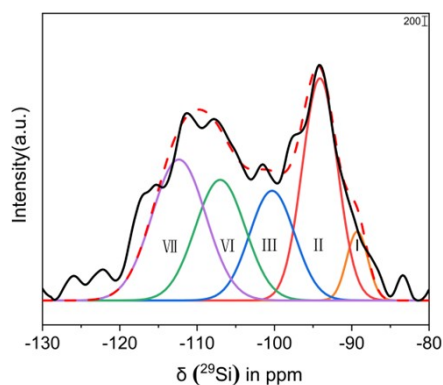


**Fig. S1.** TEM image of the 4%Ni/SAPO-11-L catalyst after calcination.

Table S2. The amount of Brønsted acid sites and Lewis acid sites of SAPO-11, 4%Ni/SAPO-11,

4%Ni/SAPO-11-L, 4%Ni/SAPO-11-LZ

Sample	Acidity (mmol/g)		
	L	B	B+L
SAPO-11	1.04	1.73	2.77
4% Ni/SAPO-11	0.32	1.33	1.65
4% Ni/SAPO-11-L	0.36	1.58	1.94
4% Ni/SAPO-11-LZ	0.21	1.38	1.59
4% Ni/SAPO-11-LLZ	0.11	1.35	1.46



**Fig. S2.** Solid state  $^{29}\text{Si}$  MAS NMR spectra for SAPO-11.

**Table S3.** Deconvolution analysis results of  $^{29}\text{Si}$  MAS-NMR spectra of SAPO-11, 4%Ni/SAPO-11, 4% Ni/SAPO-11-L, 4%Ni/SAPO-11-LZ and 4%Ni/SAPO-11-LLZ

Catalyst	Relative content	SA dominant			
		Relative content	Relative content	Relative content	Relative content
	Si (4Al 0Si) (%)	Si (3Al 1Si) (%)	Si (2Al 2Si) (%)	Si (1Al 3Si) (%)	Si (0Al 4Si) (%)
SAPO-11	5.2	30.7	17.7	21.6	24.8
4%Ni/SAPO-11	4.4	39.1	11.9	15.6	29
4%Ni/SAPO-11-L	13.7	16.8	15.4	19.5	34.6
4%Ni/SAPO-11-LZ	4.7	36.6	10.3	18.4	30
4%Ni/SAPO-11-LLZ	7.2	31.1	20.6	14.3	26.8

**Table S4.** Acid distribution of SAPO-11, 4% Ni/SAPO-11, 4% Ni/SAPO-11-L, 4%Ni/SAPO-11-LZ and 4%Ni/SAPO-11-LLZ

Sample	Acidity( $\mu\text{mol/g}$ )			Total acid
	Weak	Medium	Strong	
SAPO-11	55	119	118	292
4% Ni/SAPO-11	50	77	107	234
4% Ni/SAPO-11-L	46	87	140	273
4% Ni/SAPO-11-LZ	39	80	102	221
4% Ni/SAPO-11-LLZ	34	82	100	216