Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supporting Information

Tuning the Metal-Support Interaction in Supported K-Promoted NiMo Catalysts for Enhanced Selectivity and Productivity of Higher Alcohol in CO Hydrogenation

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Table S1 Nominal composition and TXRF results of K,Ni-*x*Mo/MMO-S and IM-K,Ni-30Mo/MMO-S catalysts

Catalysts	Nominal composition (wt. %)			TXRF (wt. %)		
	K	Ni	Mo	K	Ni	Mo
K,Ni-5Mo/MMO-S	2.3	6.3	4.9	2.35	5.47	3.44
K,Ni-12Mo/MMO-S	2.3	6.2	11.5	2.18	5.17	9.83
K,Ni-17Mo/MMO-S	2.3	6.3	16.5	2.49	5.97	14.15
K,Ni-25Mo/MMO-S	2.3	6.0	23.3	2.42	6.52	20.28
K,Ni-30Mo/MMO-S	2.2	5.8	29.7	2.66	6.89	25.47
K,Ni-35Mo/MMO-S	2.1	5.6	35.6	2.41	7.10	29.75
IM-K,Ni-30Mo/MMO-S	2.2	5.8	29.7	2.36	6.54	24.16

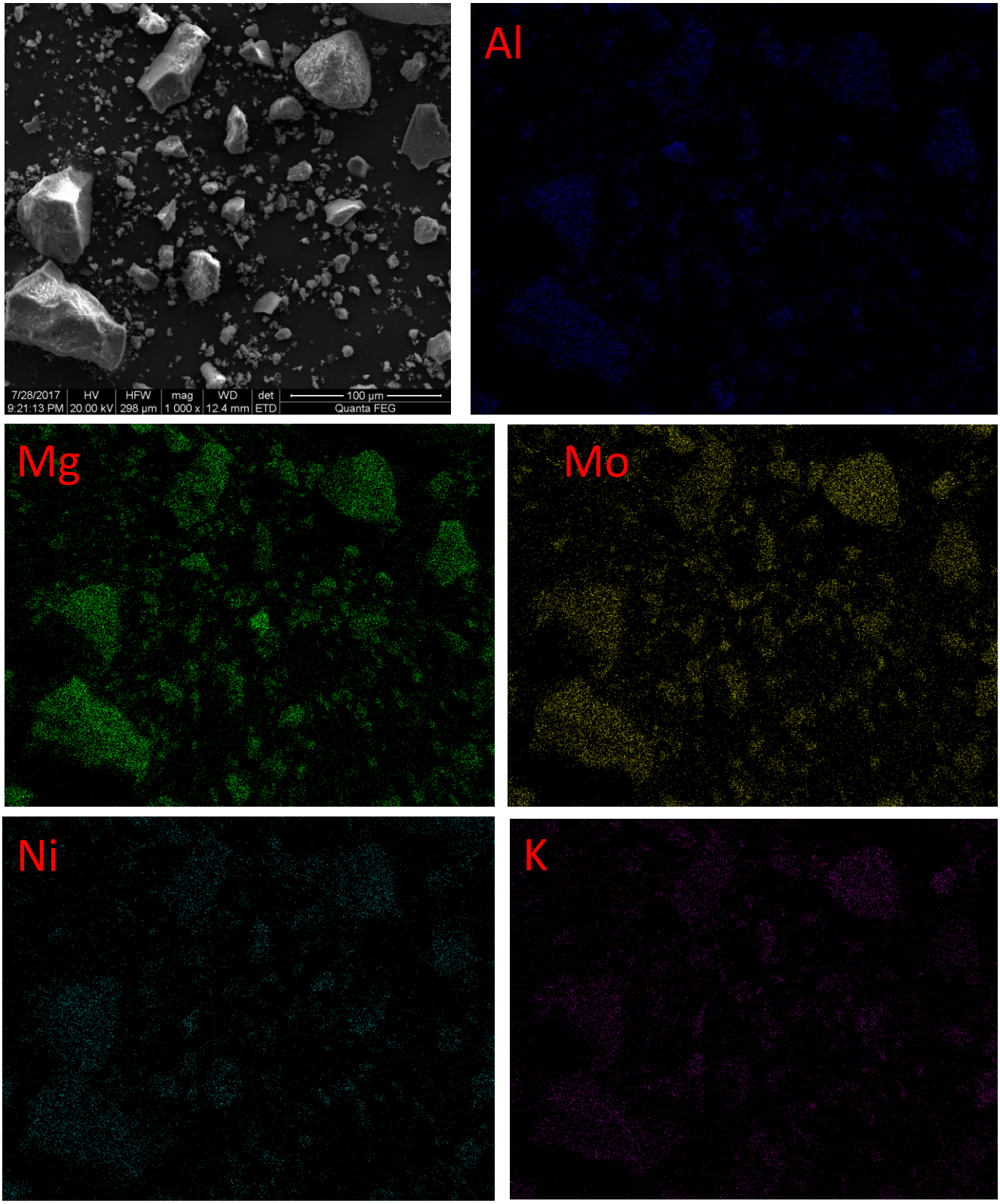

Fig. S1. FESEM images and the corresponding element mapping of K,Ni-30Mo/MMO catalyst.

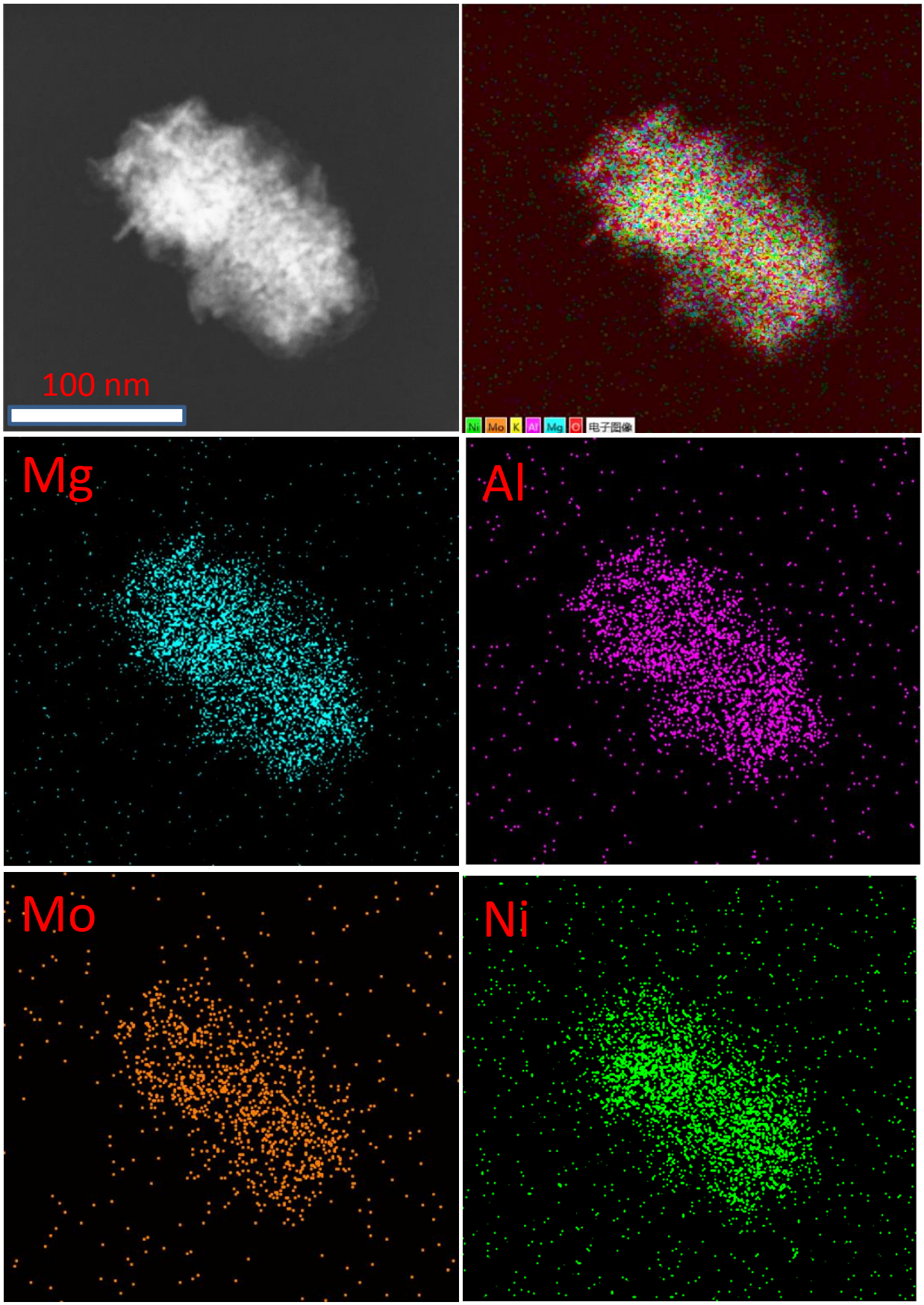

Fig. 2. HAADF-STEM images and element mappings of K,Ni-30Mo/MMO catalyst.

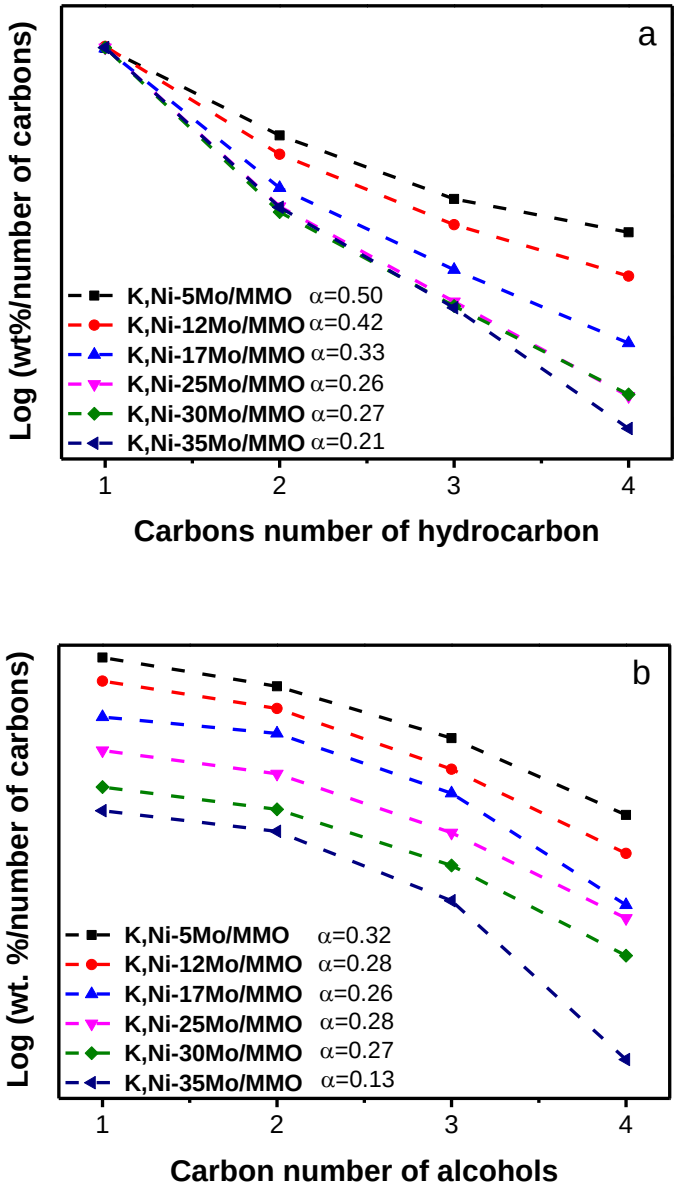

Fig. S3. The ASF distribution of (a) hydrocarbon, (b) alcohols on K,Ni-*x*Mo/MMO catalysts. The α values were computed for C2–C4 hydrocarbons and linear alcohols, respectively.

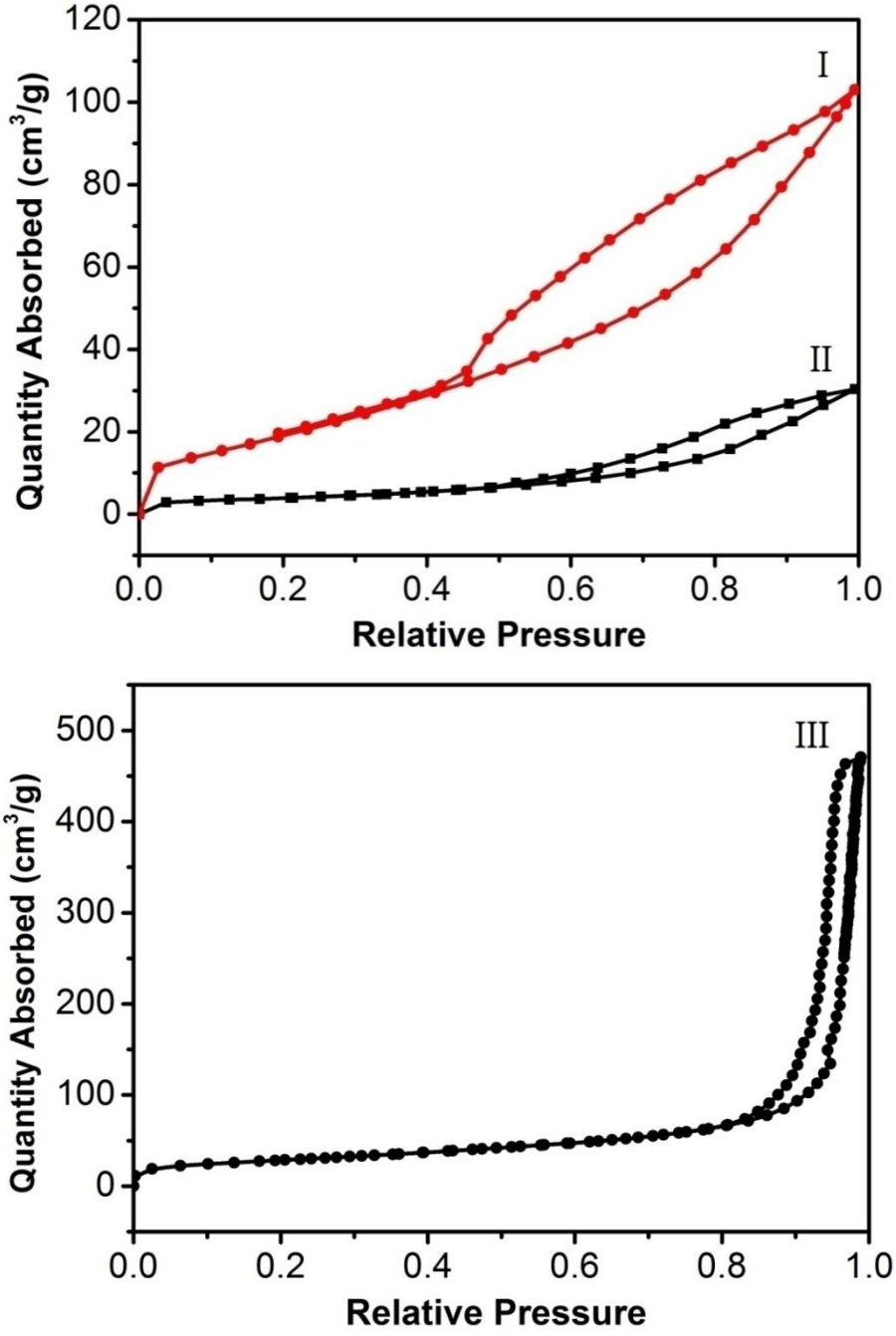

Fig. S4. N_2 adsorption-desorption isotherms of (I) K,Ni-30Mo/MMO, (II) IM-K,Ni-30Mo/MMO, and (III) MMO.

Table S2 Textural properties of K,Ni-30Mo/MMO, IM-K,Ni-30Mo/MMO and MMO

Catalysts	Surface area (m^2/g)	Pore volume (mL/g)	pore diameter (nm)
MMO	99.6	0.728	24.3
K,Ni-30Mo/MMO	66.1	0.159	5.4
IM-K,Ni-30Mo/MMO	13.7	0.047	7.8

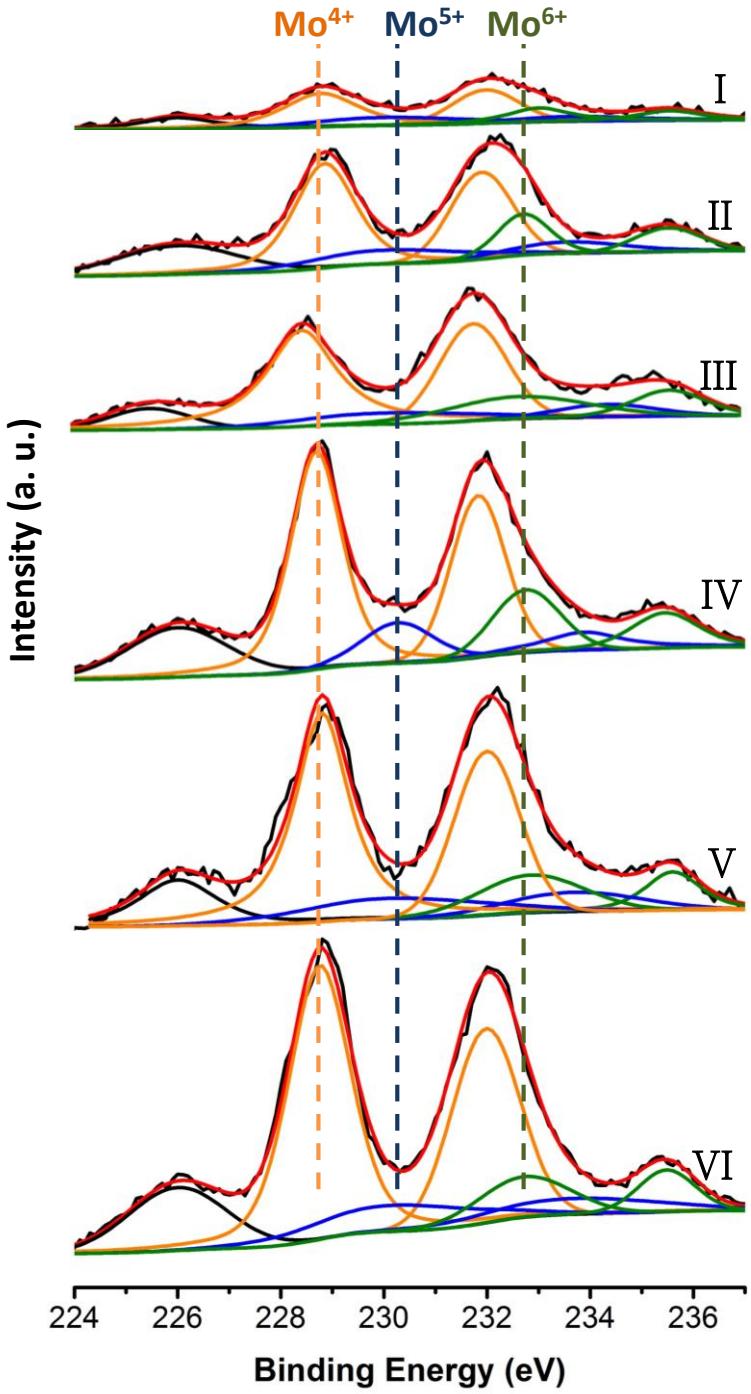

Fig. S5. Deconvoluted XPS patterns of (I) K,Ni-5Mo/MMO-S, (II) K,Ni-12Mo/MMO-S, (III) K,Ni-17Mo/MMO-S, (IV) K,Ni-25Mo/MMO-S, (V) K,Ni-30Mo/MMO-S, (VI) K,Ni-35Mo/MMO-S.

Table S3 Binding Energies and sulphidation degree of presulfided K,Ni-*x*Mo/MMO-S and IM-K,Ni-30Mo/MMO-S catalysts

Catalysts	Binding Energies for $Mo3d_{5/2}$ (eV)			Sulphidation degree
	Mo^{4+}	Mo^{5+}	Mo^{6+}	
K,Ni-5Mo/MMO-S	228.8	230.1	233.0	57.7 %
K,Ni-12Mo/MMO-S	228.9	230.1	232.7	63.3 %
K,Ni-17Mo/MMO-S	228.5	230.1	232.7	66.1 %
K,Ni-25Mo/MMO-S	228.7	230.3	232.8	65.2 %
K,Ni-30Mo/MMO-S	228.8	230.2	232.8	67.1 %
K,Ni-35Mo/MMO-S	228.8	230.2	232.7	71.6 %
IM-K,Ni-30Mo/MMO-S	228.4	229.5	232.0	47.7 %