Supporting Information

Utilizing Red Mud from Industrial Waste as Catalysts for the Hydrogenation of CO₂ into Value Added Chemicals

Mahbuba Aktary,[a] Mohammed A. Sanhoob,[b] Atif S. Alzharani,* [a, c]

Huda S. Alghamdi,[b] Afnan M. Ajeebi,[b] Md. Abdul Aziz,[b] M. Nasiruzzaman Shaikh [b,*]

[a] *Materials Science and Engineering Department (MSE), King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia*

[b] *Interdisciplinary Research Center for Hydrogen Technologies and Carbon Management (IRC-HTCM), King Fahd University of Petroleum & Minerals, Dhahran 31261, Saudi Arabia*

[c] *Interdisciplinary Research Center for Sustainable Energy Systems (IRC-SES), King Fahd University of Petroleum & Minerals, Dhahran 31261, Saudi Arabia*

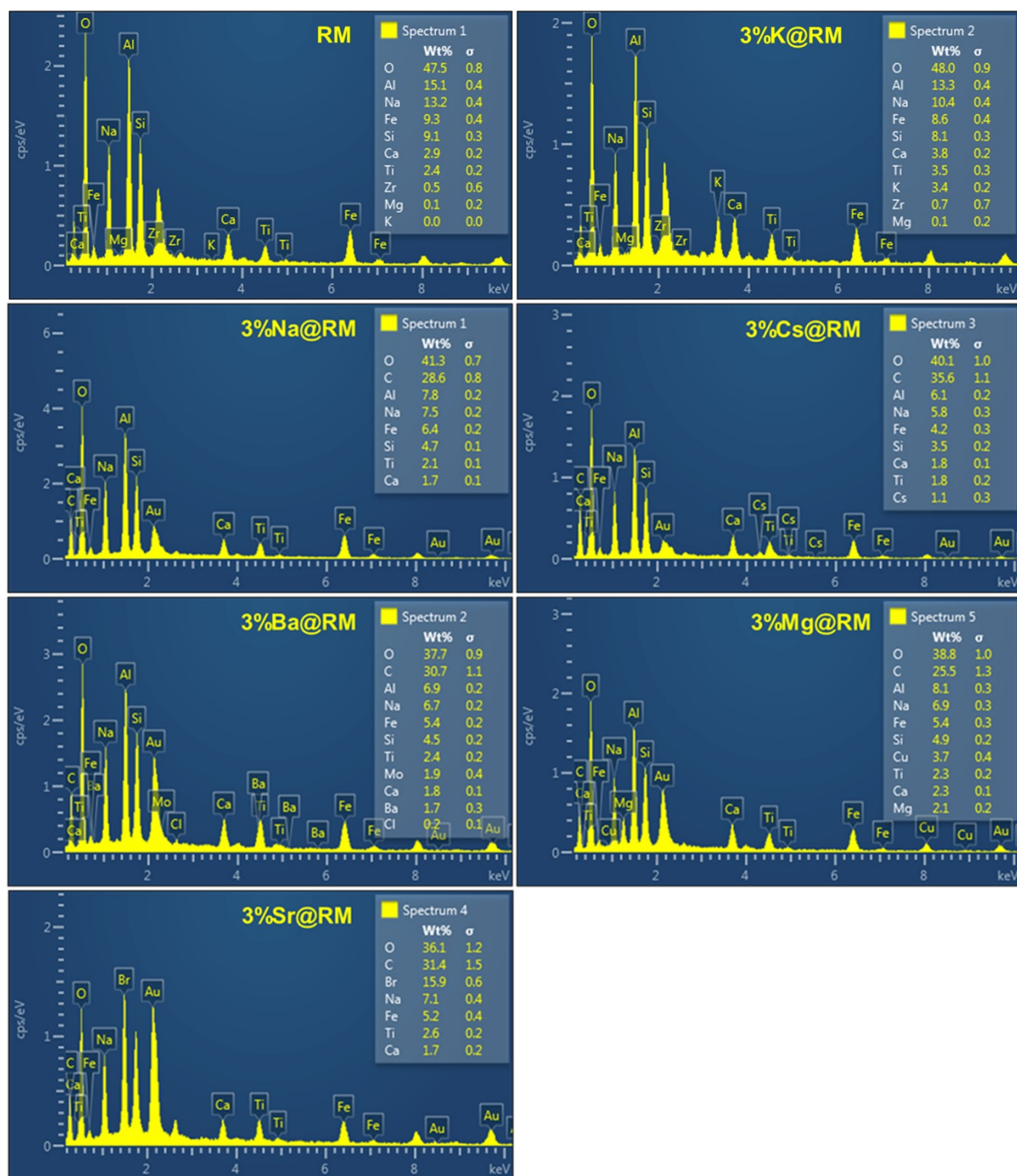| Contents	Page#
EDS mapping of 3% metal-promoted Red Mud.	3
Elemental mapping of 3% metal promoted Red Mud.	4
XRF data for elemental composition of Red Mud (RM) and RM-based catalysts.	4
HR-TEM of 3% metal promoted Red Mud.	5
CO_2 conversion and hydrocarbon selectivity data of pure RM, 3%K@RM, and different wt% Fe-promoted RM.	5

Figure S1: EDS mapping of 3% metal-promoted Red Mud.

Table S1: XRF data for elemental composition of Red Mud (RM) and RM-based catalysts.

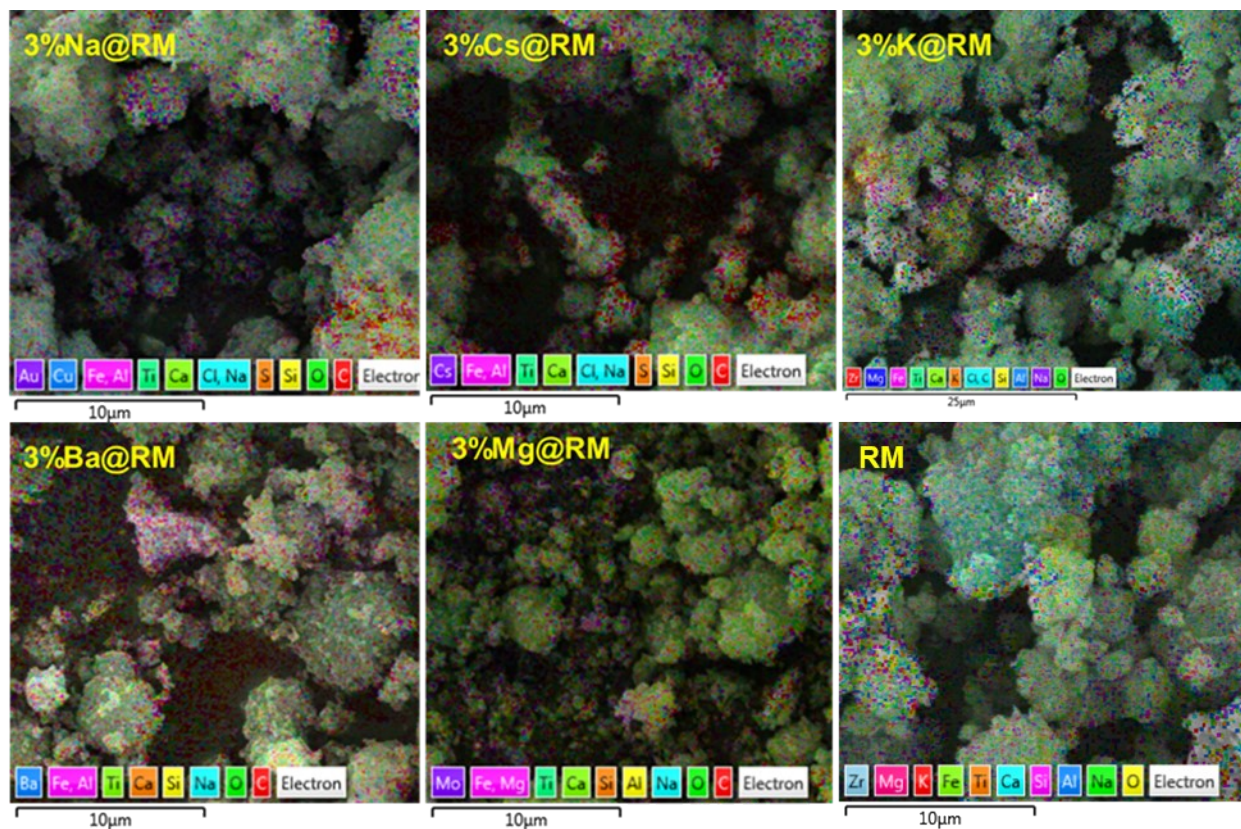| Element	RM	3%KOH@RM	HCl-RM
Na	19.83	17.68	0
K	0.12	3.87	0.05
Mg	0	0	0
Ca	8.67	9.11	1.59
Fe	28.79	30.54	44.79
Al	20.4	19.25	10.3
Ti	7.46	7.36	13.44
Si	12.88	12.21	29.83

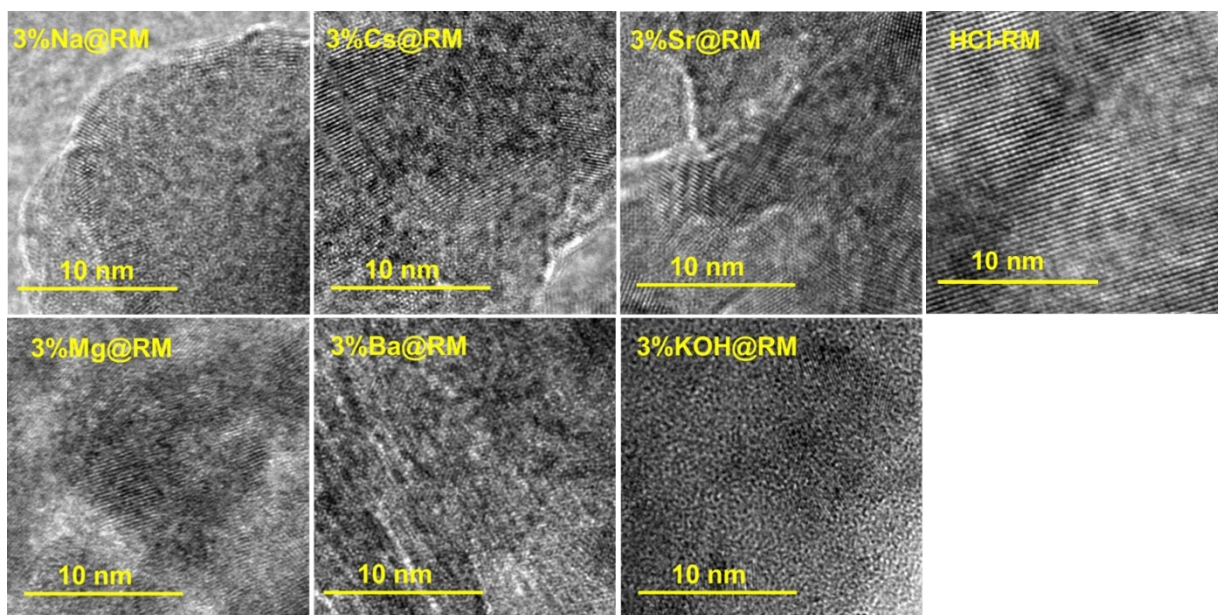**Figure S2**: Elemental mapping of 3% metal-promoted Red Mud.

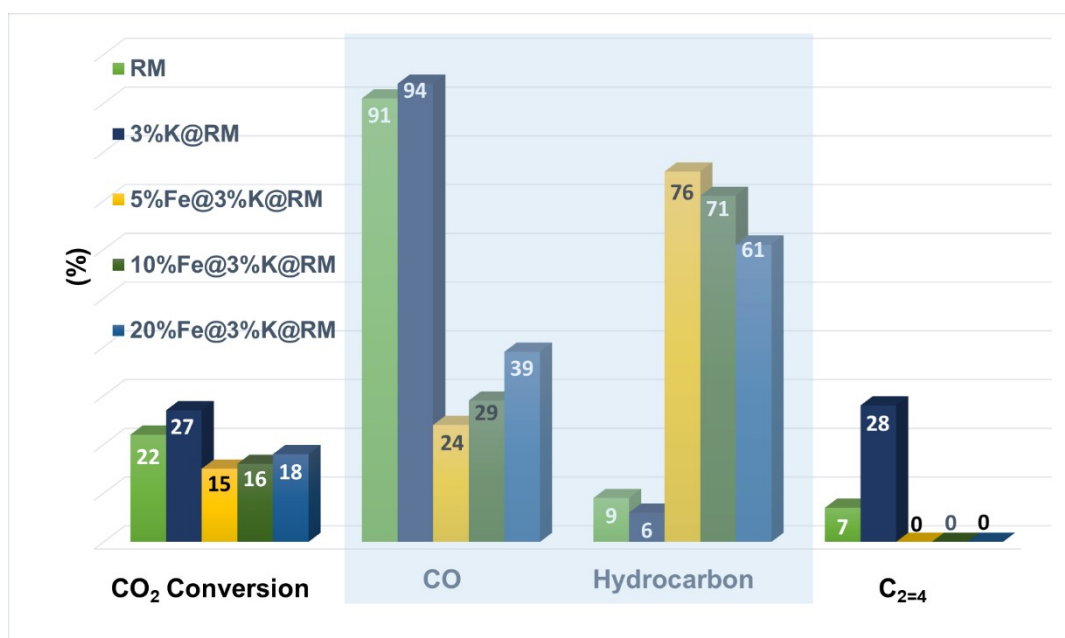**Figure S3**: HR-TEM of 3% metal-promoted Red Mud.

Figure S4: CO_2 conversion and hydrocarbon selectivity data of pure RM, 3%K@RM, and X(=5,10, 20) wt% Fe-promoted RM.