Article

Role of Mixed Oxides in Hydrogen Production Through Dry Reforming of Methane Over Nickel Catalysts Supported on Modified γ-Al₂O₃

Ahmed Sadeq Al-Fatesh [1,*], Mayankkumar Lakshmanbhai Chaudhary [2], Anis Hamza Fakeeha [1,3], Ahmed Aidid Ibrahim [1], Fahad Al-Mubaddel [1,3], Samsudeen Olajide Kasim [1], Yousef Abdulrahman Albaqmaa [1], Abdulaziz A. Bagabas [4], Rutu Patel [2] and Rawesh Kumar [2]

[1] Chemical Engineering Department, College of Engineering, King Saud University, P.O. Box 800, Riyadh 11421, Saudi Arabia; anishf@ksu.edu.sa (A.H.F.); aididwthts2011@gmail.com (A.A.I.); falmubaddel@ksu.edu.sa (F.A.-M.); sofkolajide2@gmail.com (S.O.K); youssef201629@gmail.com (Y.A.A.)

[2] Sankalchand Patel University, Visnagar, Gujarat, India, 384315; mayankchaudhary8326@gmail.com (M.L.C.); rutupatel1145@gmai.com (R.P.); kr.rawesh@gmail.com (R.K.)

[3] King Abdullah City for Atomic & Renewable Energy, Energy Research & Innovation Center (ERIC) in Riyadh, Riyadh 11451 Saudi Arabia

[4] National Petrochemical Technology Center (NPTC), Materials Science Research Institute (MSRI), King Abdulaziz City for Science and Technology (KACST), P.O. Box 6086, Riyadh 11442, Saudi Arabia; abagabas@hotmail.com (A.B.)

* Correspondence: aalfatesh@ksu.edu.sa (A.S.A.-F.); Tel.: +966-11-467-6859
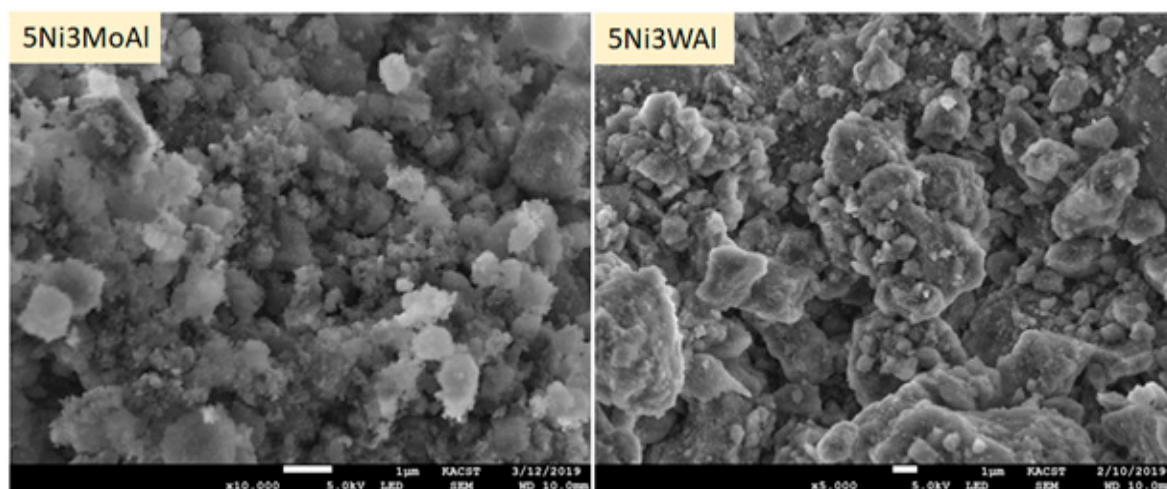
Supporting Information

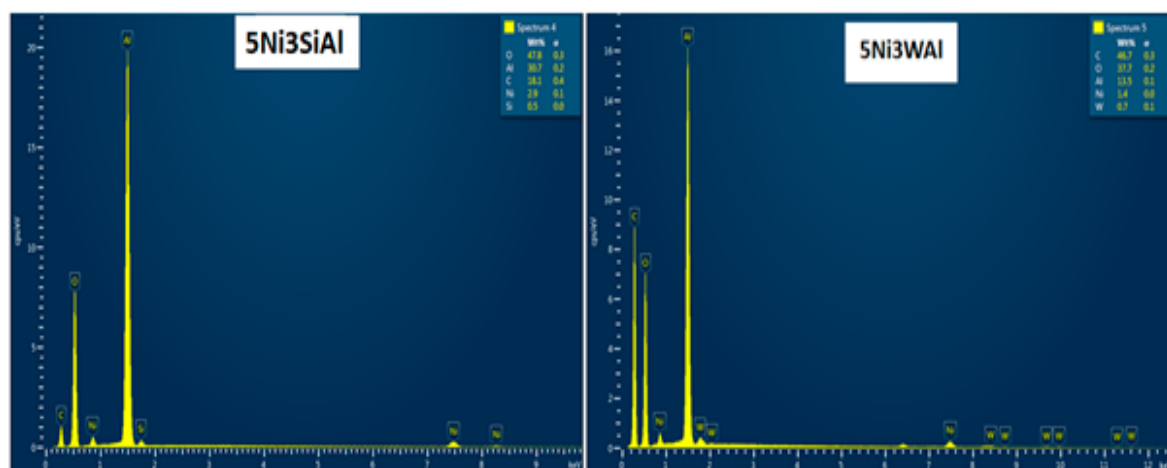**Figure S1.** SEM image of different catalyst system.

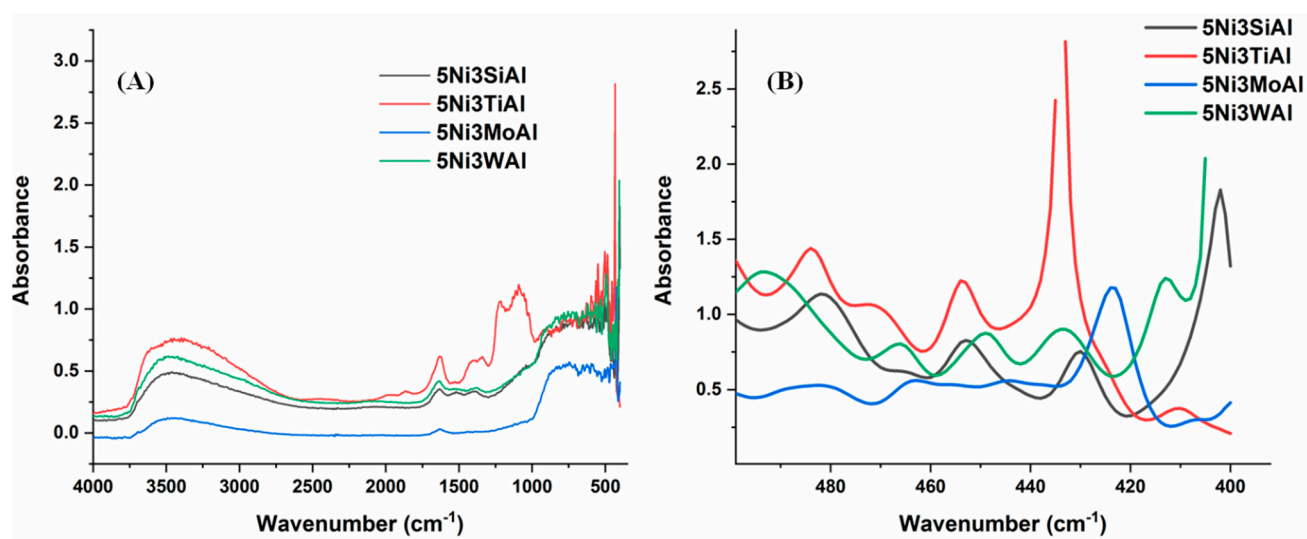
Figure S2. EDX spectra of different catalyst system.

Figure S3. Infrared spectroscopy of different catalyst system.
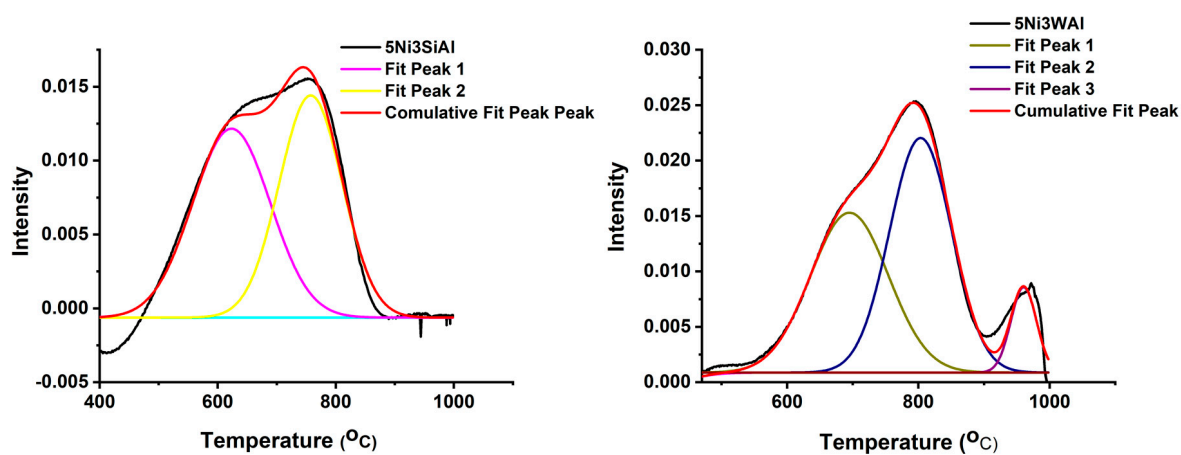
Model	Gaussian		Model	Gaussian		
Equation	y = y0 + A/(w*sqrt(pi/(4*ln(2)))) * exp(-4*ln(2)*(x-xc)^2/w^2)		Equation	y = y0 + A/(w*sqrt(pi/(4*ln(2)))) * exp(-4*ln(2)*(x-xc)^2/w^2)		
Plot	Fit Peak 1	Fit Peak 2	Plot	Fit Peak 1	Fit Peak 2	Fit Peak 3
y0	-6.23062E-4 ± 4.11782E-5	-6.23062E-4 ± 4.11782E-5	y0	8.75357E-4 ± 2.76608E-4	8.75357E-4 ± 2.76608E-4	8.75357E-4 ± 2.76608E-4
xc	623.40187 ± 2.64164	757.55764 ± 1.71734	Xc	694.98475 ± 4.69806	803.46743 ± 2.27811	960.47305 ± 0.55166
A	2.10967 ± 0.07832	2.00929 ± 0.07676	A	2.14687 ± 0.18504	2.50601 ± 0.15739	0.37637 ± 0.02653
w	155.07424 ± 4.15424	125.59527 ± 2.48834	w	139.89097 ± 7.37806	111.24908 ± 2.83516	45.94283 ± 2.12497
Reduced Chi-Sqr	5.95E-07		Reduced Chi-Sqr	1.16E-06		
R-Square (COD)	0.9845		R-Square (COD)	0.98287		
Adj. R-Square	0.98421		Adj. R-Square	0.98232		

Figure S4. Deconvoluted H_2 temperature-programmed surface reduction profiles of (A) 5Ni3SiAl catalyst, and (B) 5Ni3WAl catalyst.