Supporting Informations
For:

Monodispersed NiO nanoparticles into SBA-15: An efficient nanocatalyst for the oxidation of cyclohexane to produce ketone-alcohol (KA) oil in mild conditions

Mohamed Abboud[a]*, Reem S. Al-Nefaie[a], Asla A. AL-Zahrani[b], Nabil Al-Zaqri[c], Mohammad Abu Haija[d], Azza Al-Ghamdi[b], Omeer Alqahtani[a], Mohamed S. Hamdy[a]

[a] Catalysis Research Group (CRG), Department of Chemistry, College of Science, King Khalid University, P.O. Box 9004, Abha 61413, Saudi Arabia.
[b] Department of Chemistry, College of Science, Imam Abdulrahman Bin Faisal University, P.O. Box 1982, Dammam 31441, Saudi Arabia.
[c] Department of Chemistry, College of Science, King Saud University, P.O. Box 2455, Riyadh 11451, Saudi Arabia.
[d] Department of Chemistry, Khalifa University of Science and Technology, Abu Dhabi, United Arab Emirates.

*Corresponding Author: Email: Abboud_med@yahoo.fr; mabboud@kku.edu.sa; Phone: +966 53 48 46 782

Content

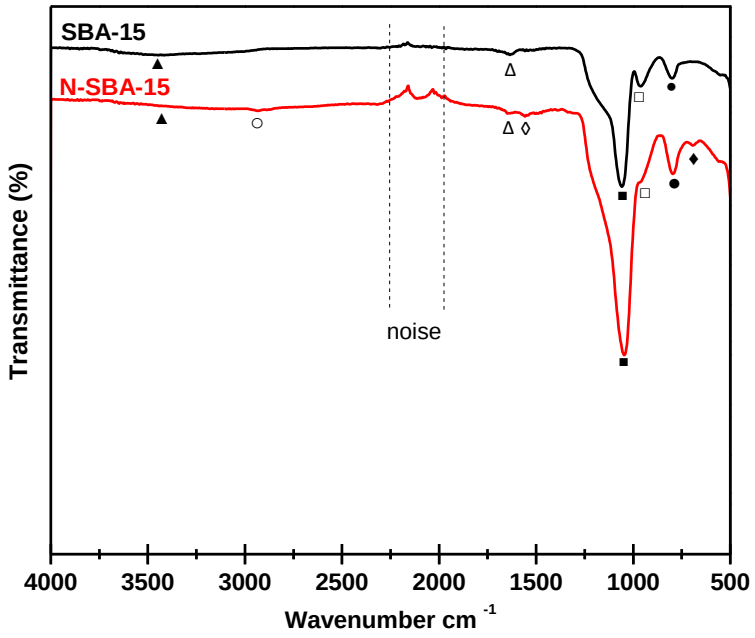

Figure S1. FT-IR spectra of SBA-15 and N-SBA-15

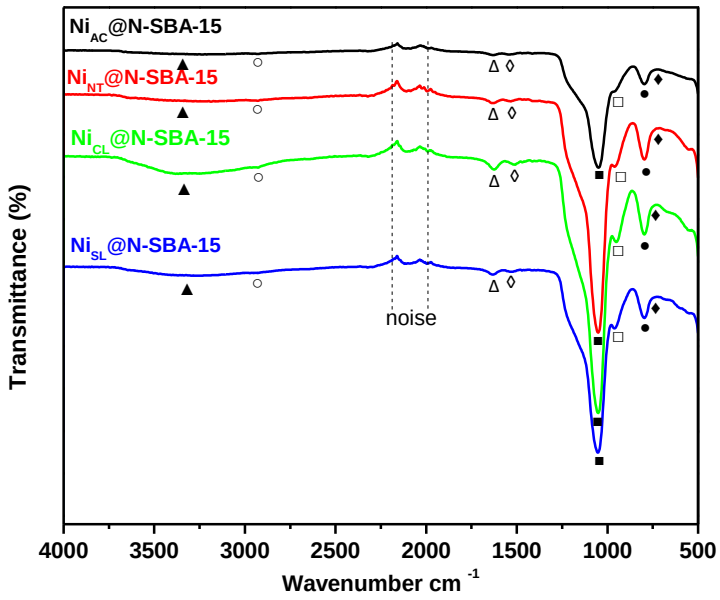

Figure S2. FT-IR spectra of four precursors Ni_j@N-SBA-15 (j = Ac, Nt, Cl, or Sl)

Table S1. FT-IR peaks of SBA-15, N-SBA-15

Samples	υ SiO-H str. (▲) (cm^{-1})	υ SiO-H deform. (Δ) (cm^{-1})	υ SiO-H bend. (□) (cm^{-1})	υ Si-O sym. (●) (cm^{-1})	υ Si-O asym. (■) (cm^{-1})	υ CH_2 (APTES) (○) (cm^{-1})	υ N-H out-plane bend. (♦) (cm^{-1})	υ N-H in-plane bend. (◊) (cm^{-1})
SBA-15	3464	1633	996	798	1056	-	-	-
N-SBA-15	3428	1637	970	794	1042	2932	730	1550

str.: stretching; bend.: bending; sym: symmetric; asym.: asymmetric. deform.: deformation.

Table S2. FTIR data of the catalyst's precursors $[Ni]_i$@N-SBA-15, SBA-15 and N-SBA-15

Samples		υ SiO-H str. (▲) (cm^{-1})	υ SiO-H deform.. (Δ) (cm^{-1})	υ SiO-H bend. (□) (cm^{-1})	υ Si-O sym. (●) (cm^{-1})	υ Si-O asym. (■) (cm^{-1})	υ CH_2 (APTES) (○) (cm^{-1})	υ N-H out-plane bend. (♦) (cm^{-1})	υ N-H in-plane bend. (◊) (cm^{-1})
SBA-15		3464	1633	996	798	1056	-	-	-
N-SBA-15		3428	1637	970	794	1042	2932	730	1550
Catalysts Precursors	**$[Ni]_{Ac}$@N-SBA-15**	3442	1626	975	798	1046	2934	734	1539
	$[Ni]_{Nt}$@N-SBA-15	3442	1630	975	798	1049	2932	727	1535
	$[Ni]_{Cl}$@N-SBA-15	3435	1626	978	795	1053	2929	734	1511
	$[Ni]_{Sl}$@N-SBA-15	3417	1630	978	791	1053	2939	734	1527

str.: stretching; bend.: bending; sym: symmetric; asym.: asymmetric; deform.: deformation.

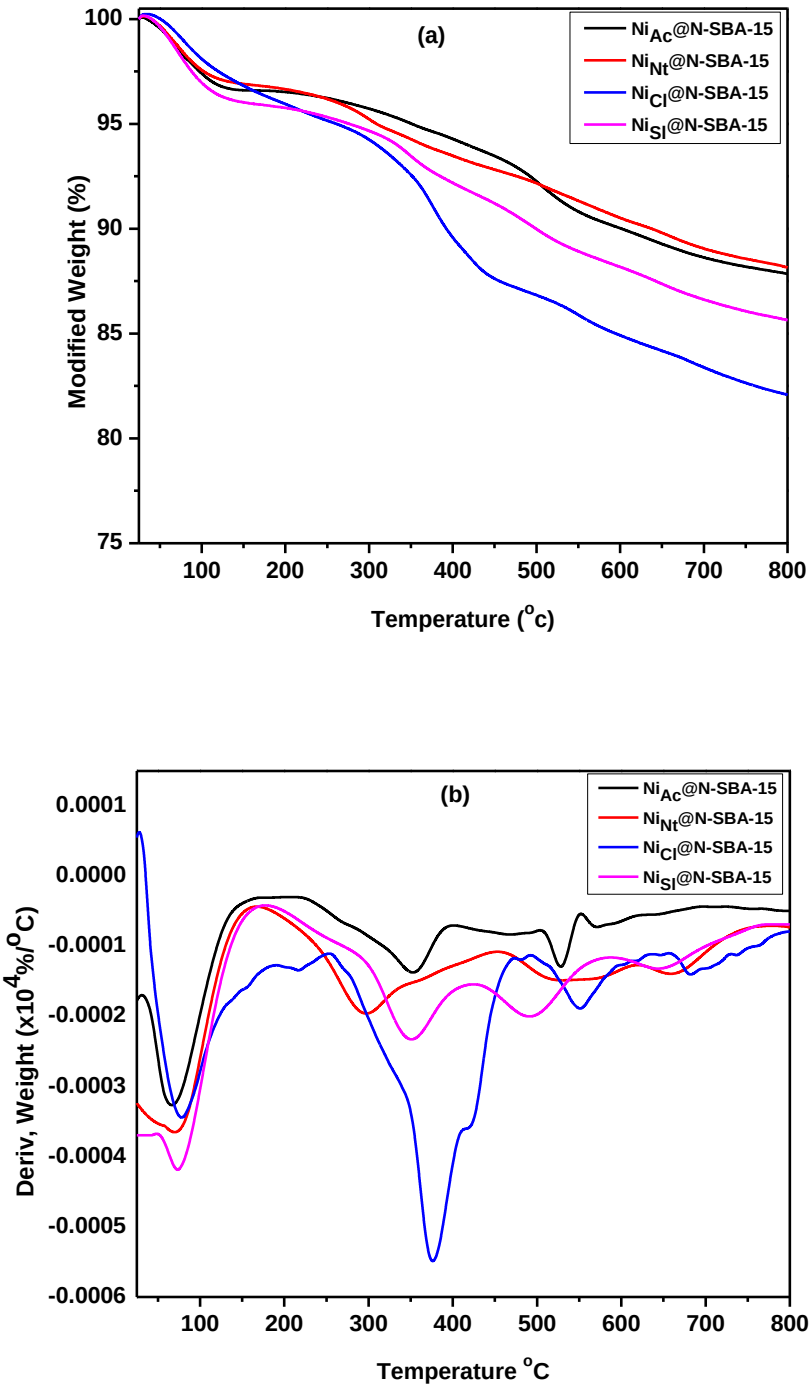

Figure S3. TGA (a) and DTA (b) analysis of precursors $[Ni]_i$@N-SBA-15 (i = Ac, Nt, Cl and Sl)

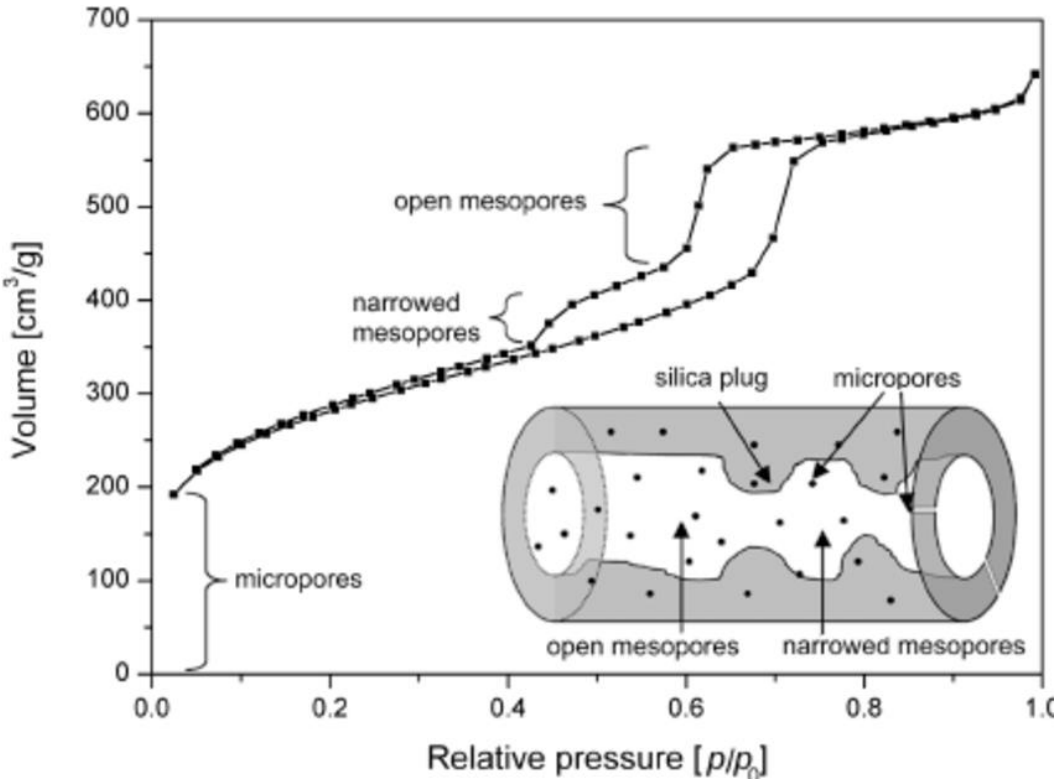

Figure S4. Effect of narrowed pores in the SBA-15 structure on the isotherm shape. [53]

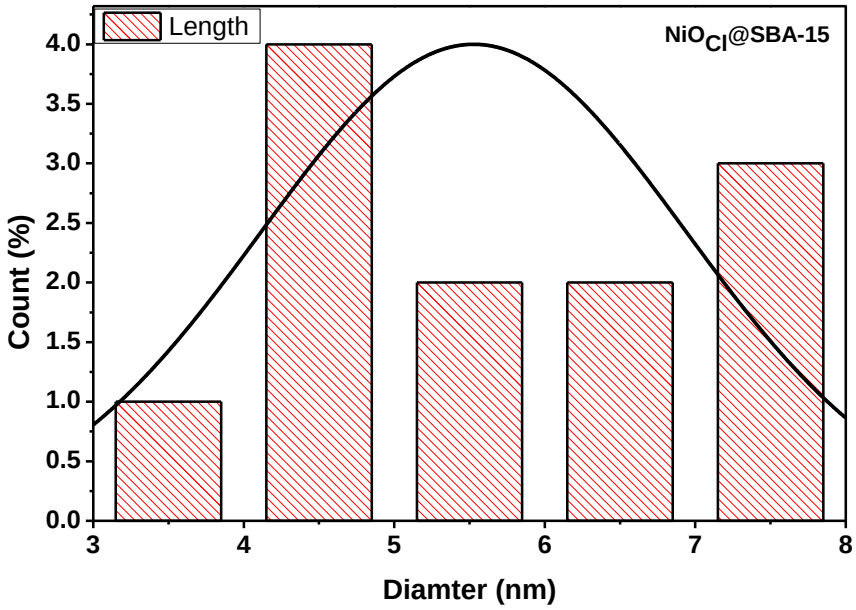

Figure S5. Particles diameter distribution in NiO_{Cl}@SBA-15

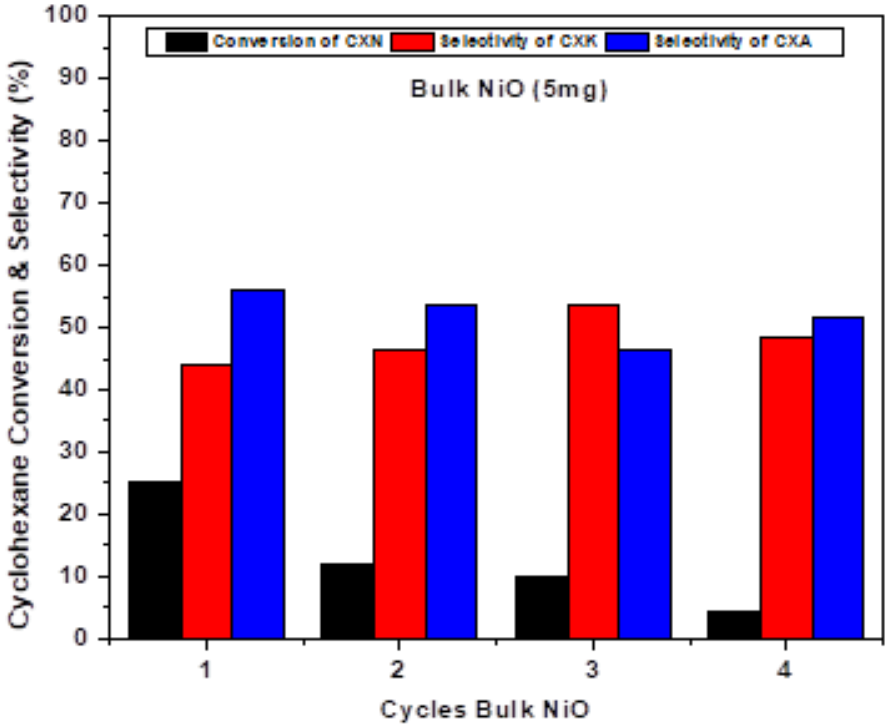

Figure S6. Reusability of bulk NiO powder as a catalyst in the oxidation of CXN with *m*-CPBA.