Electronic Supplementary Material (ESI) for RSC Advances.

Organic-Inorganic Hybrid Catalysts Containing New Schiff Base for Environment Friendly Cyclohexane Oxidation

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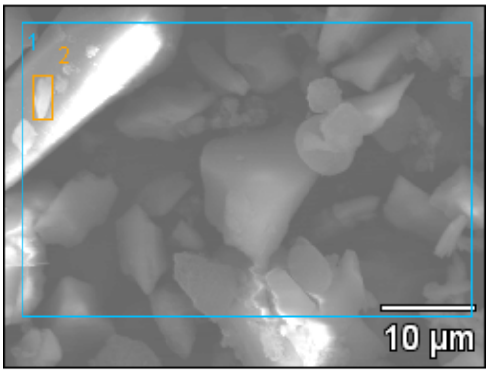
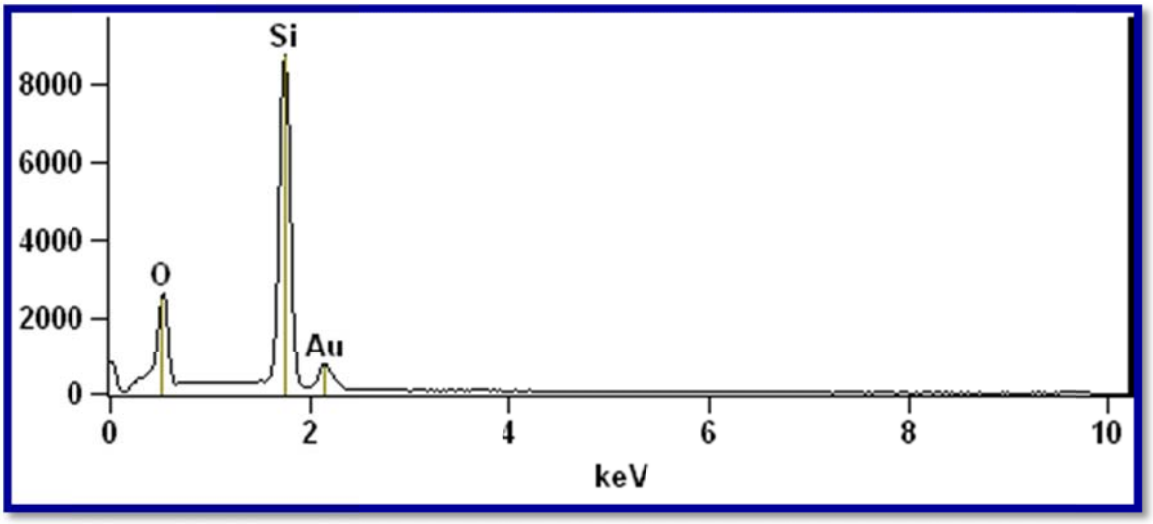
Table of Contents

1. EDS Analysis of SiO_2 Gel





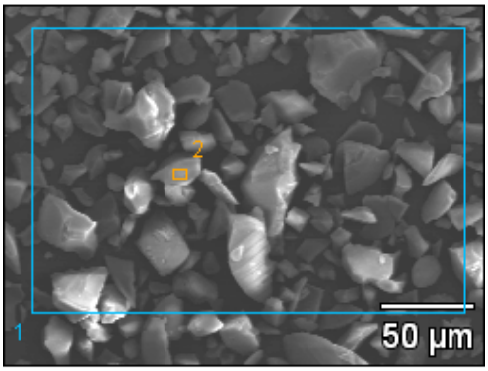
Net Counts

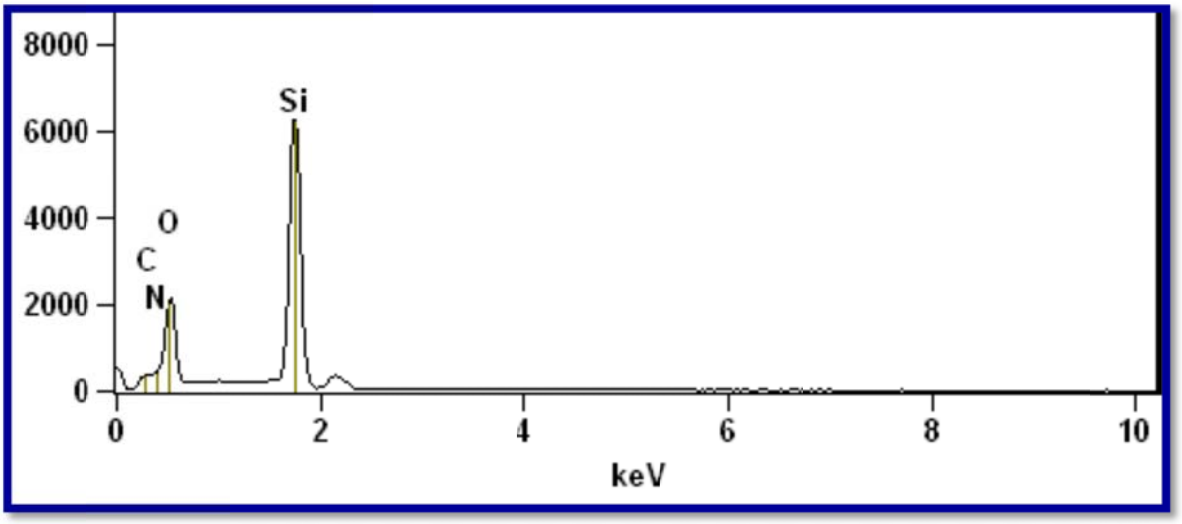
O	*Si*
19873	98836

Atom %

O	*Si*
55.87	44.13

2. EDS Analysis of Si-NH_2





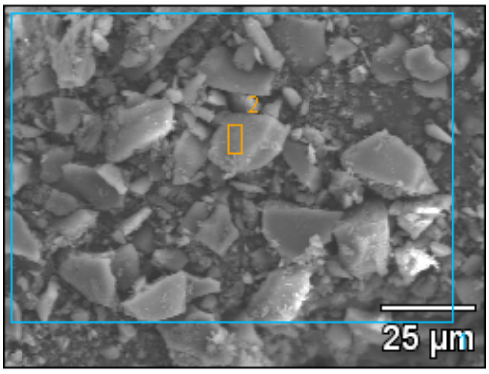
Net Counts

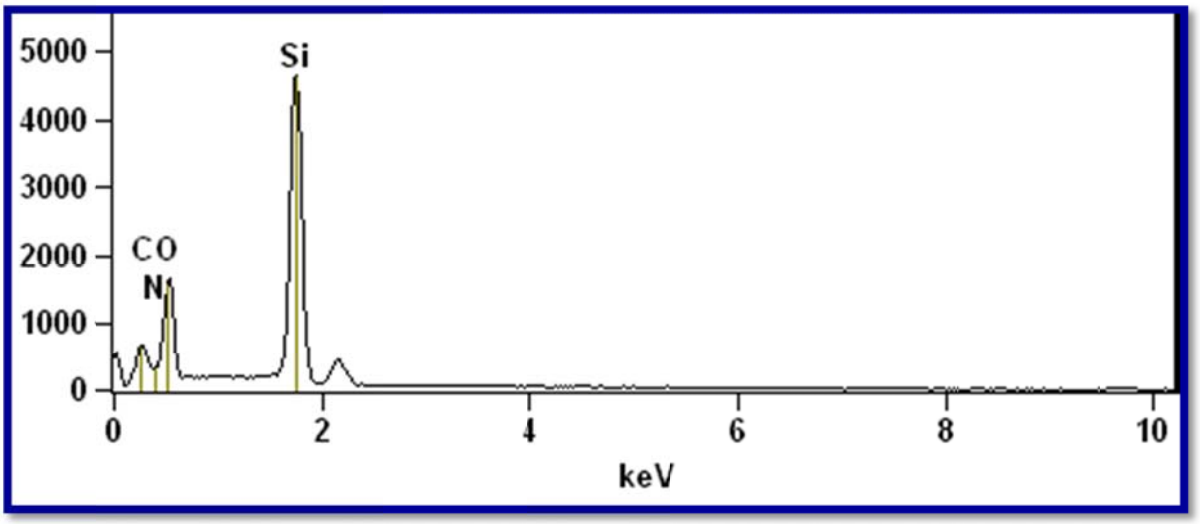
C	*N*	*O*	*Si*
3040	3005	19453	72307

Atom %

C	*N*	*O*	*Si*
16.35	15.23	46.49	21.93

3. EDS Analysis of Si-NH_2-DPED





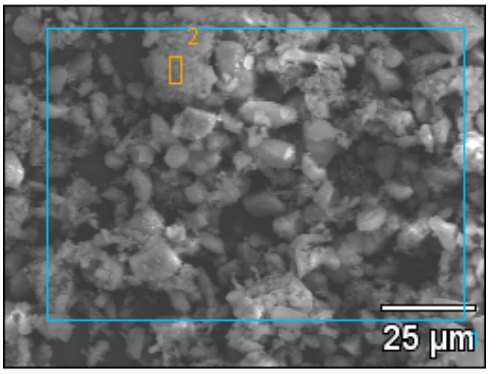
Net Counts

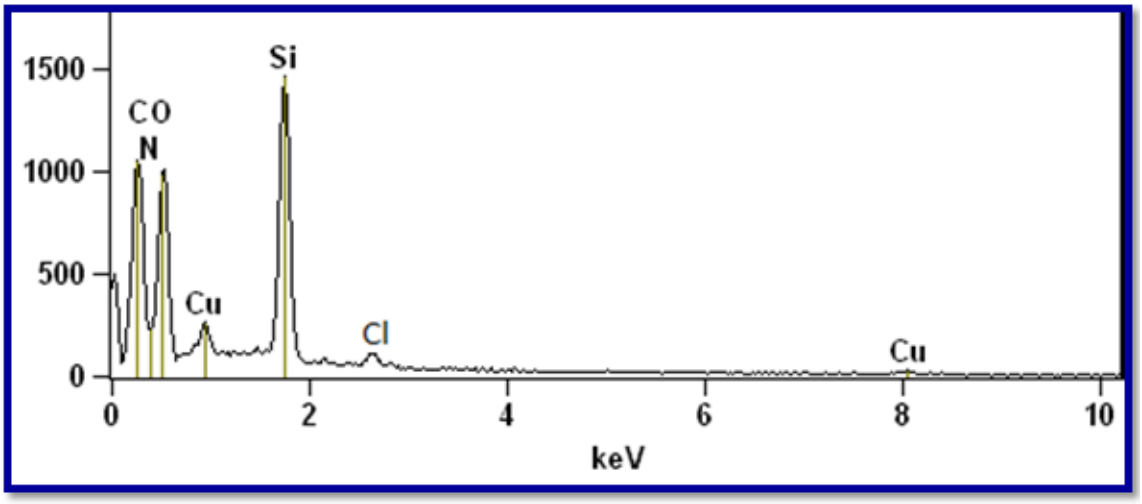
C	*N*	*O*	*Si*
5602	1504	13500	54315

Atom %

C	*N*	*O*	*Si*
30.86	10.84	39.72	18.57

4. EDS Analysis of [Cu(Si-NH_2-DPED)Cl_2]





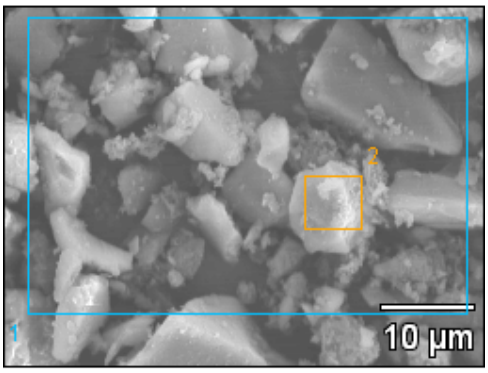
Net Counts

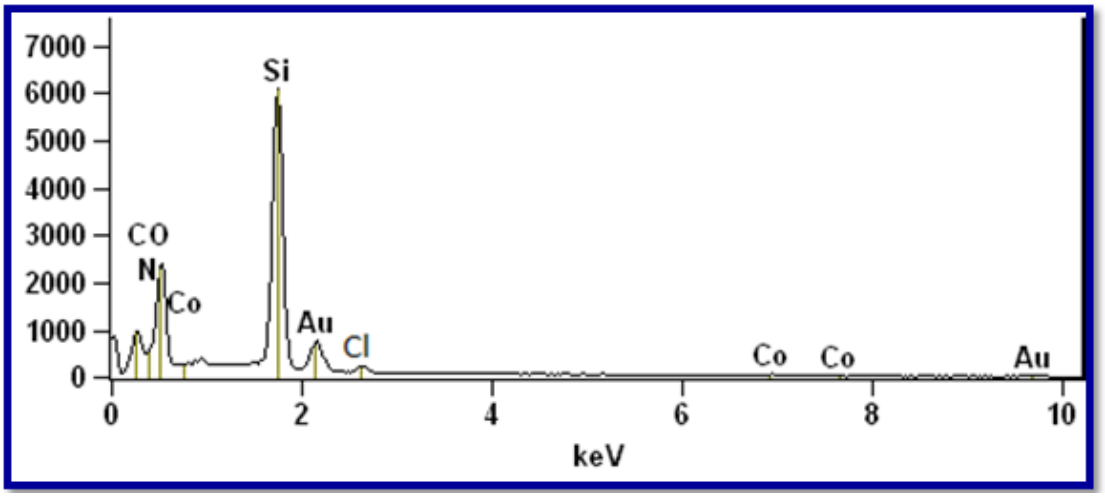
C	*N*	*O*	*Si*	*Cu*	*Cl*
9401	800	8554	15609	322	270

Atom %

C	*N*	*O*	*Si*	*Cu*	*Cl*
44.90	8.96	36.93	7.58	0.89	0.74

5. EDS Analysis of [Co(Si-NH_2-DPED)Cl_2]





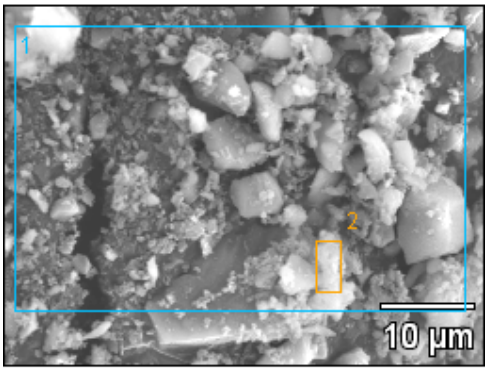
Net Counts

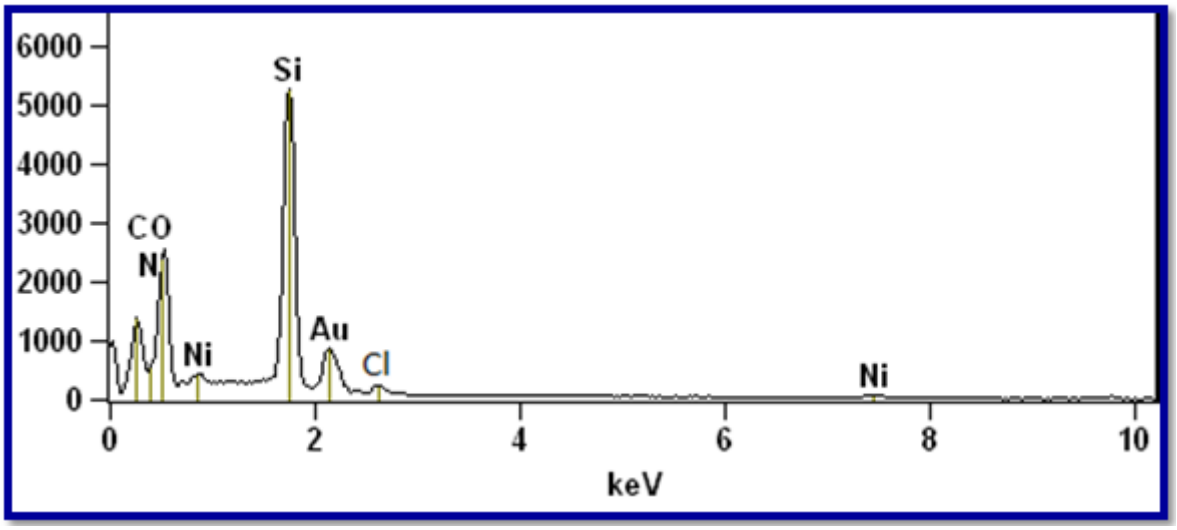
C	*N*	*O*	*Si*	*Co*	*Cl*
8006	2711	20277	66509	399	282

Atom %

C	*N*	*O*	*Si*	*Co*	*Cl*
28.82	12.84	41.57	16.14	0.34	0.29

6. EDS Analysis of [Ni(Si-NH_2-DPED)Cl_2]





Net Counts

C	*N*	*O*	*Si*	*Ni*	*Cl*
11551	2125	21304	58759	914	307

Atom %

C	*N*	*O*	*Si*	*Ni*	*Cl*
34.92	10.02	40.33	13.51	0.91	0.31

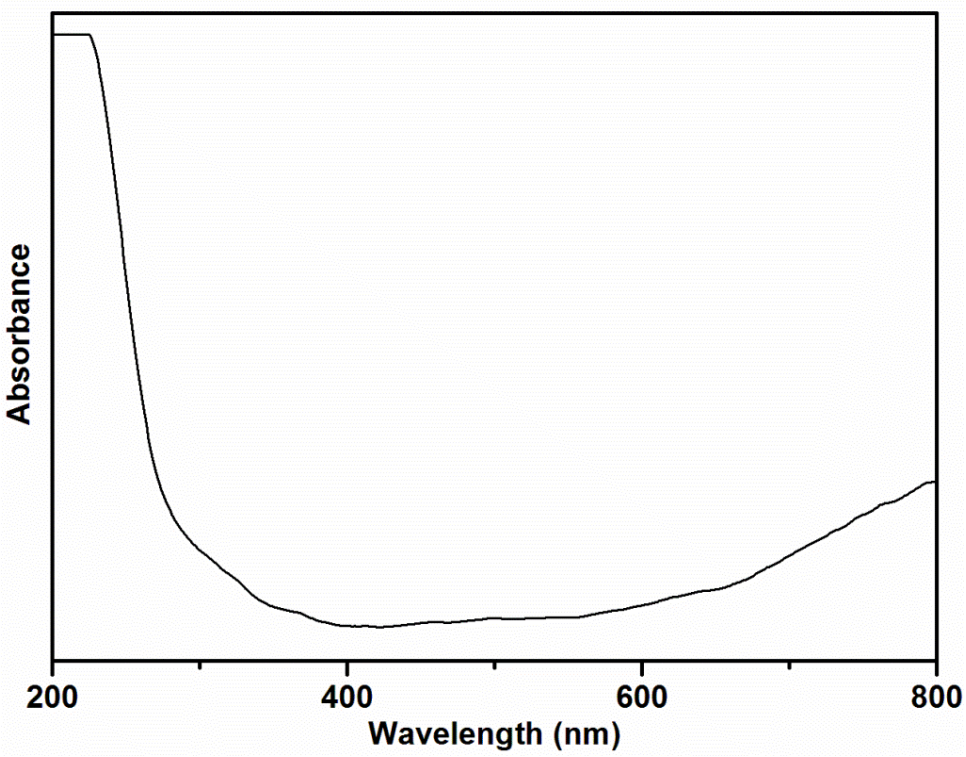


Figure S1. UV.Vis. spectrum of SiO_2 gel

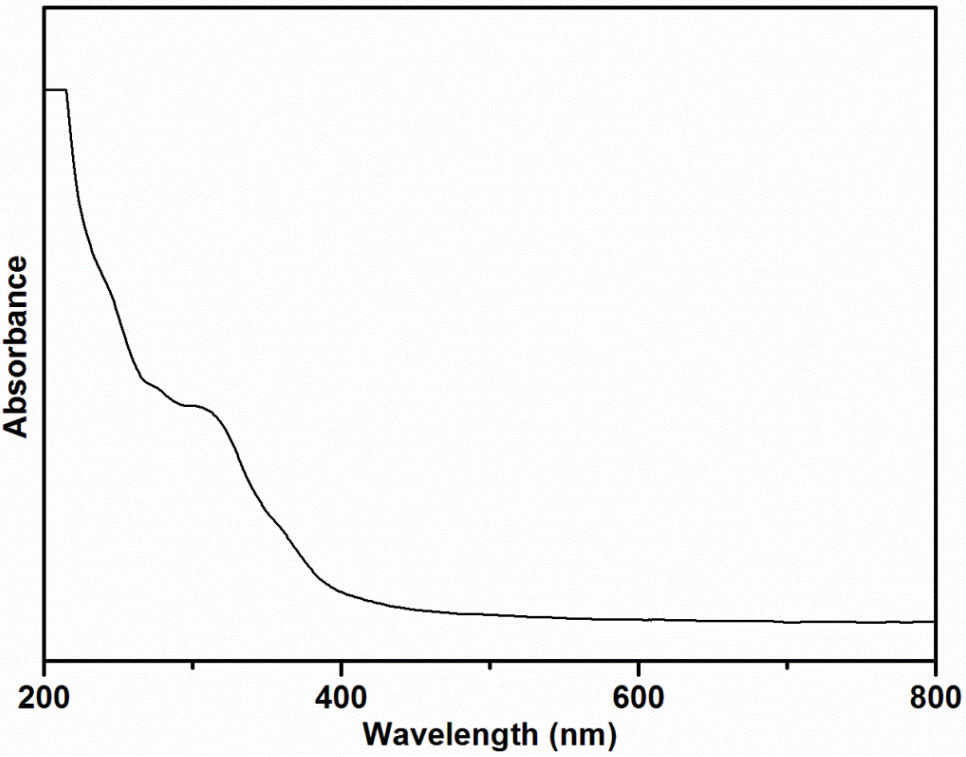


Figure S2. UV.Vis. spectrum of Si-NH_2

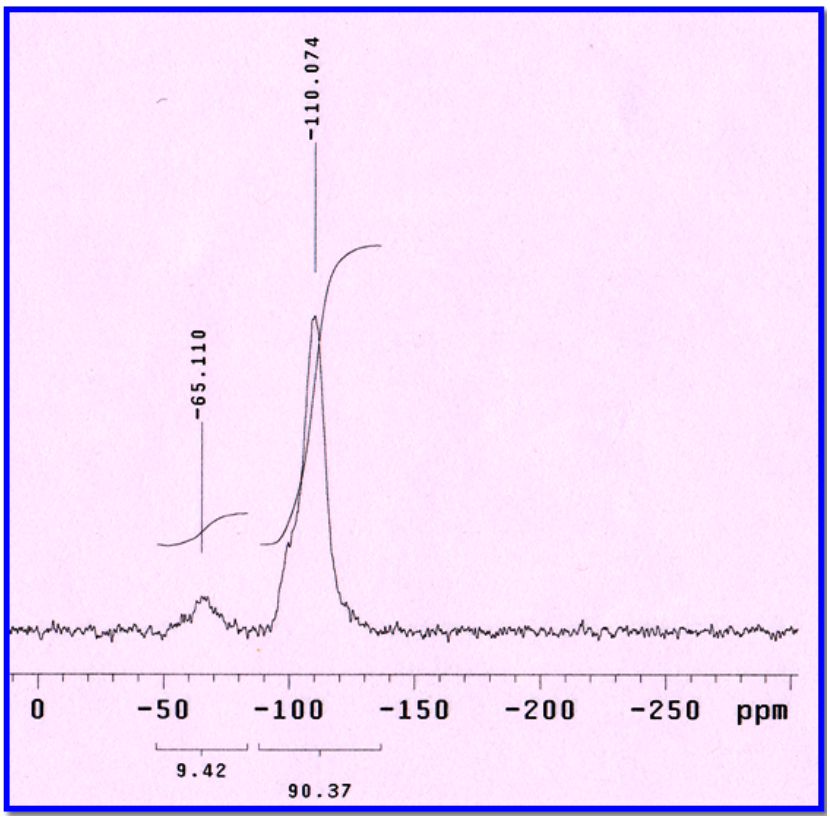


Figure S3. ^{29}Si CP MAS NMR spectrum of Si-NH_2-DPED

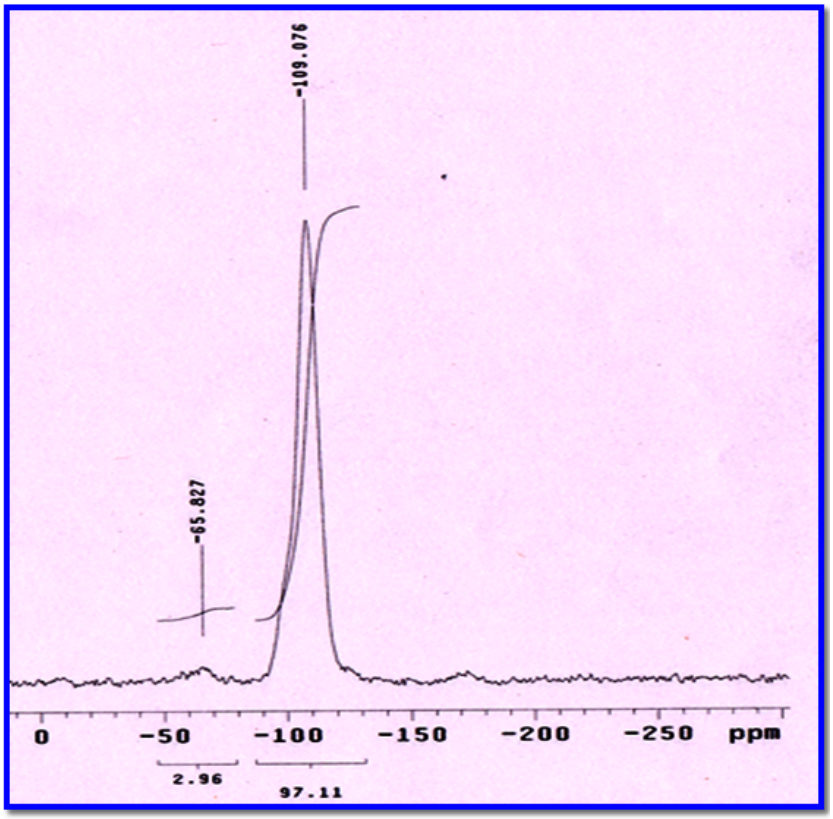


Figure S4. ^{29}Si CP MAS NMR spectrum of [Cu(Si-NH_2-DPED)Cl_2]

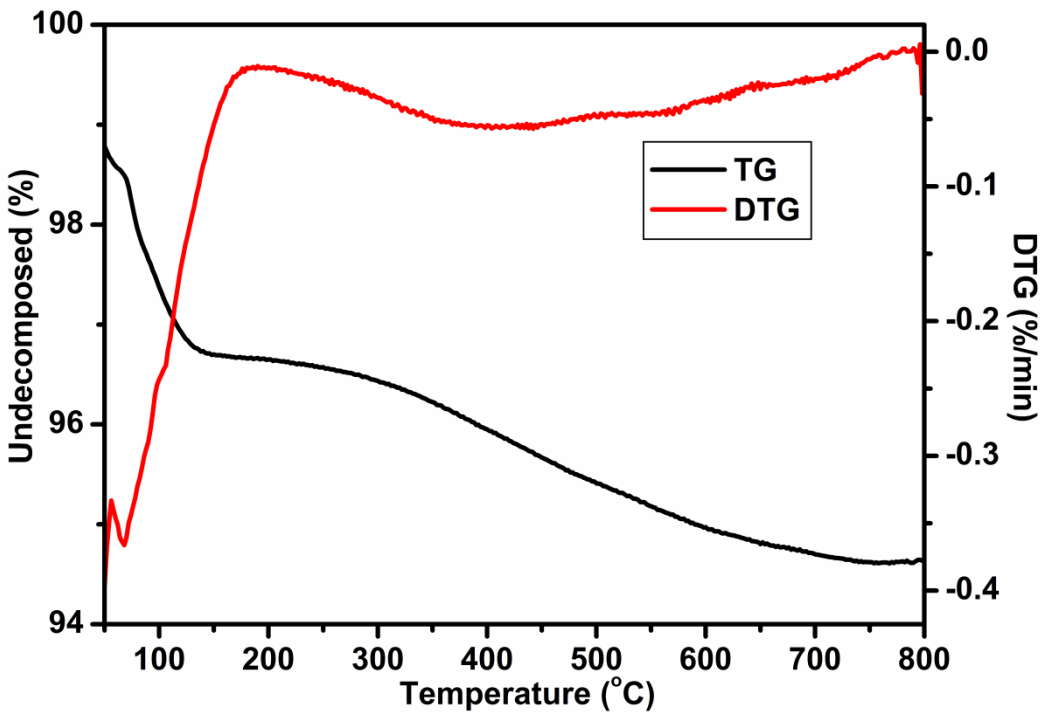


Figure S5. TG-DTG curves of SiO_2 gel

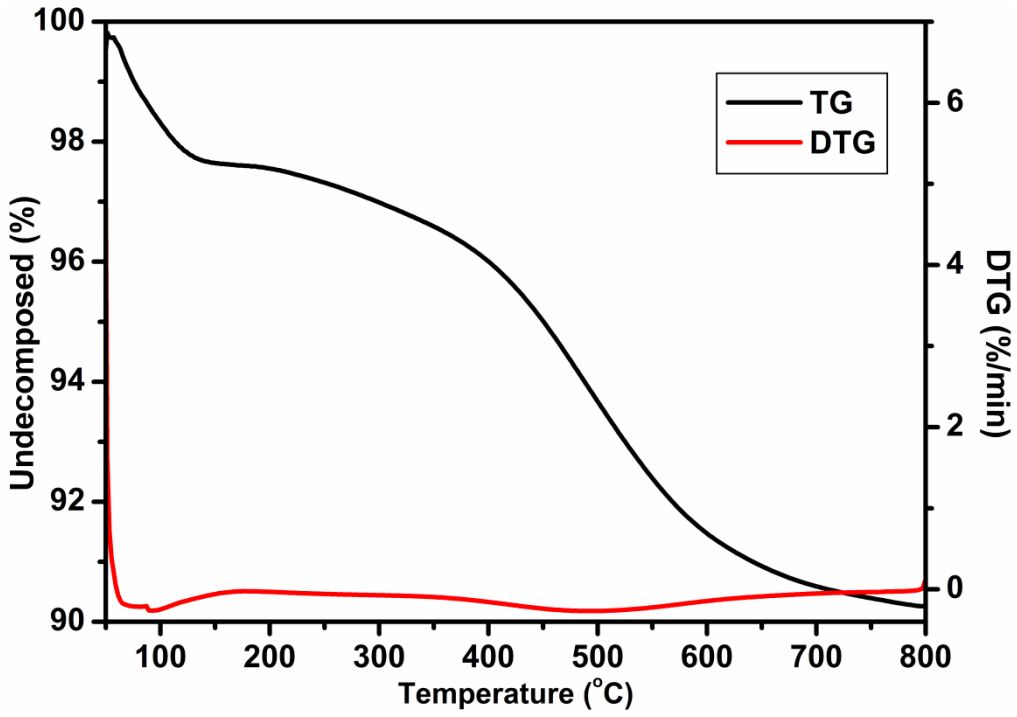


Figure S6. TG-DTG curves of Si-NH_2

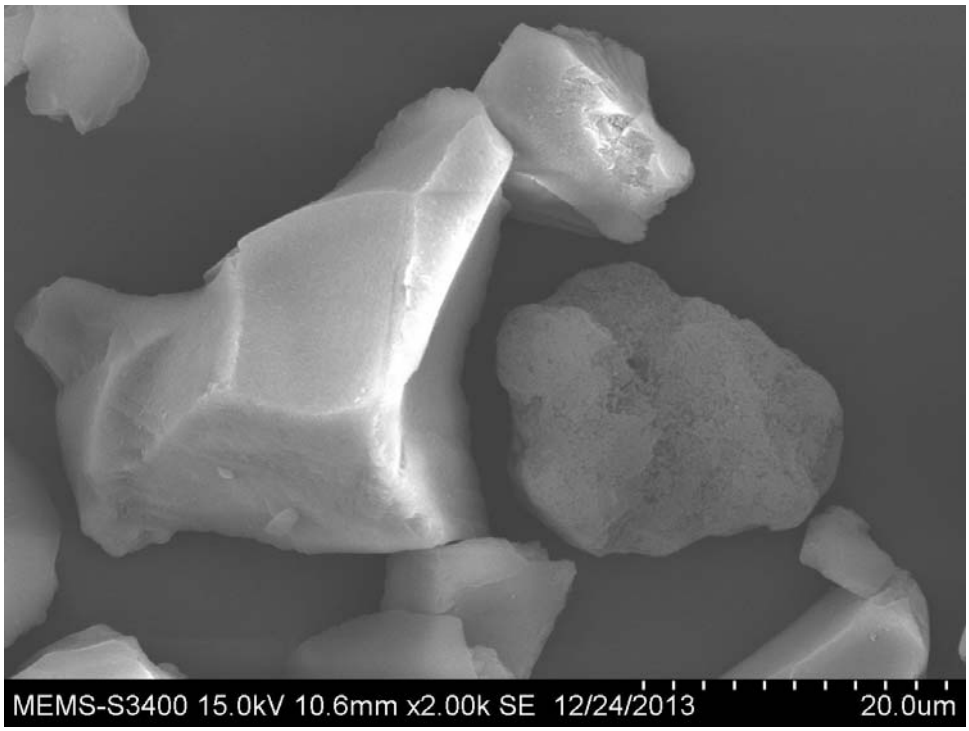


Figure S7. SEM image of SiO_2 gel

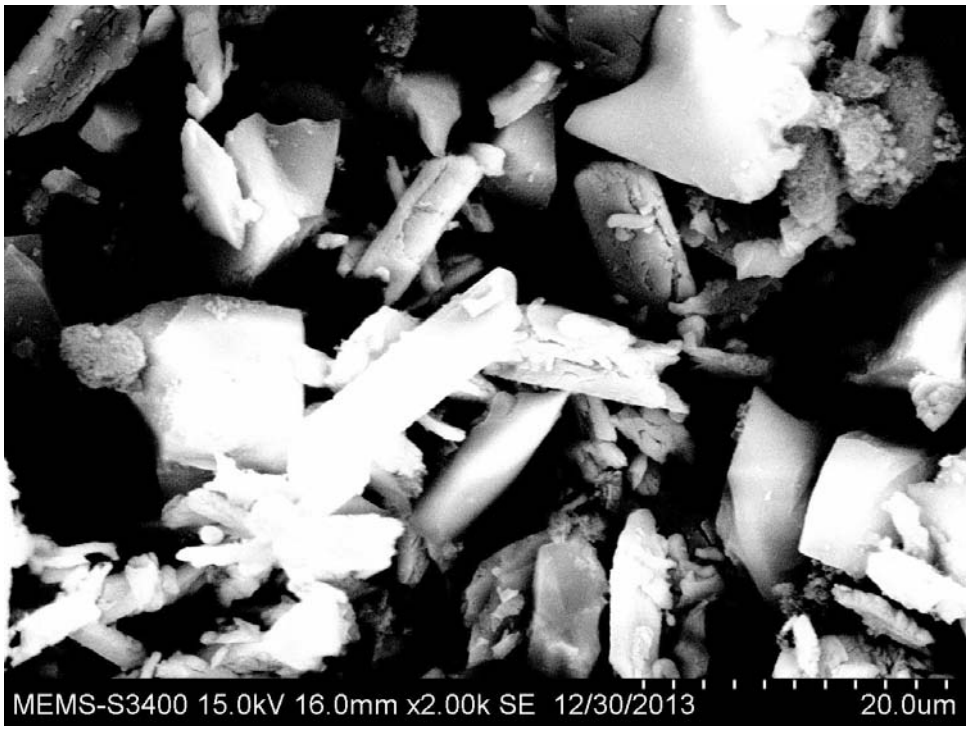


Figure S8. SEM image of Si-NH_2

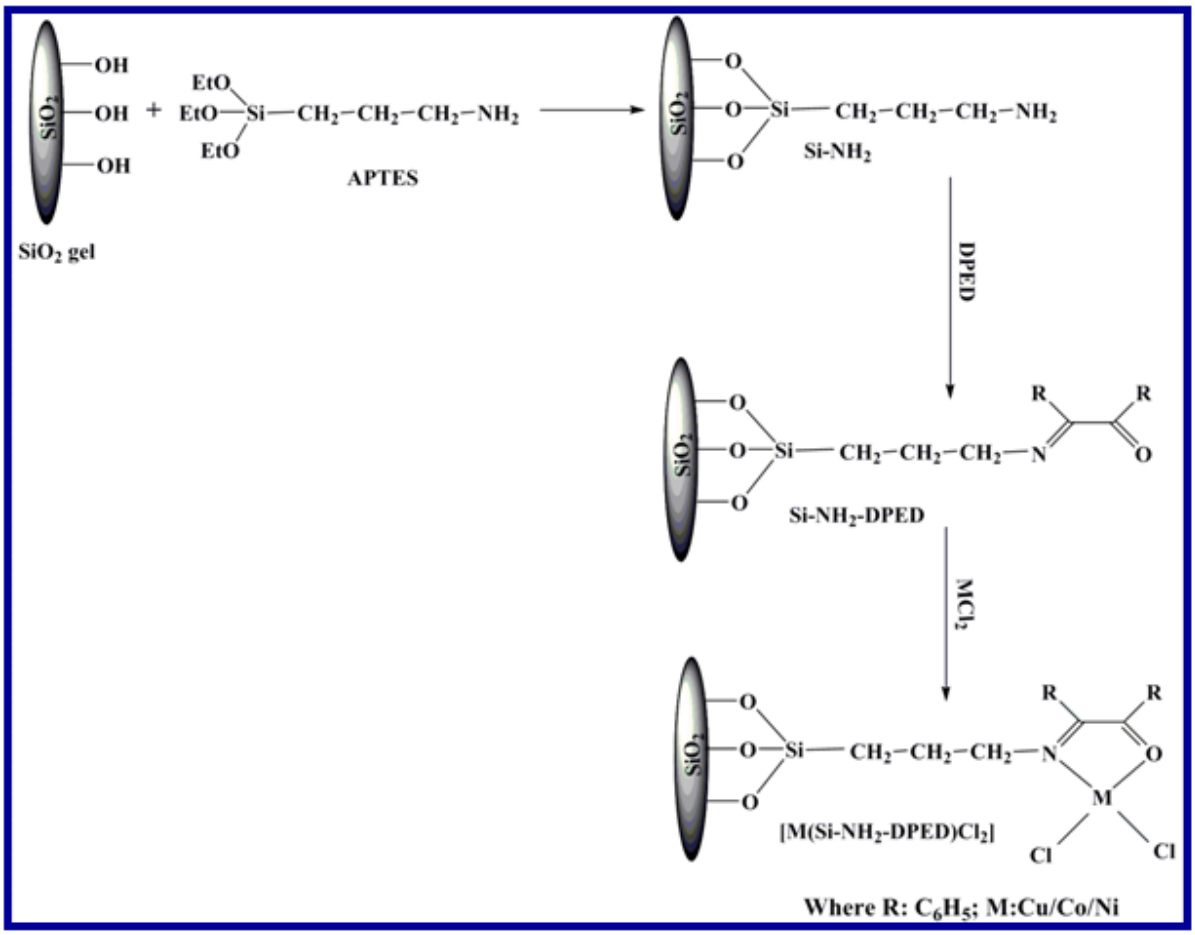


Figure S9: Schematic of the synthesis of complexes

Table 1: Influence of reaction time on cyclohexane oxidation catalyzed by Cu(II), Co(II) and Ni(II) hybrid catalysts

No.	Catalyst	Conversion (%)					
		2h	4h	6h	8 h	10h	12h
1[a]	[Cu(Si-NH_2-DPED)Cl_2]	-	-	-	-	-	-
2[b]	[Cu(Si-NH_2-DPED)Cl_2]	-	-	-	-	-	-
3[c]	[Cu(Si-NH_2-DPED)Cl_2]	-	-	-	-	-	-
4[d]	[Cu(Si-NH_2-DPED)Cl_2]	7	15	28	37	41	44
5[c]	[Co(Si-NH_2-DPED)Cl_2]	-	-	-	-	-	-
6[d]	[Co(Si-NH_2-DPED)Cl_2]	5	12	25	32	36	38
7[c]	[Ni(Si-NH_2-DPED)Cl_2]	-	-	-	-	-	-
8[d]	[Ni(Si-NH_2-DPED)Cl_2]	4	10	23	31	34	35

Mechanism of cyclohexane oxidation

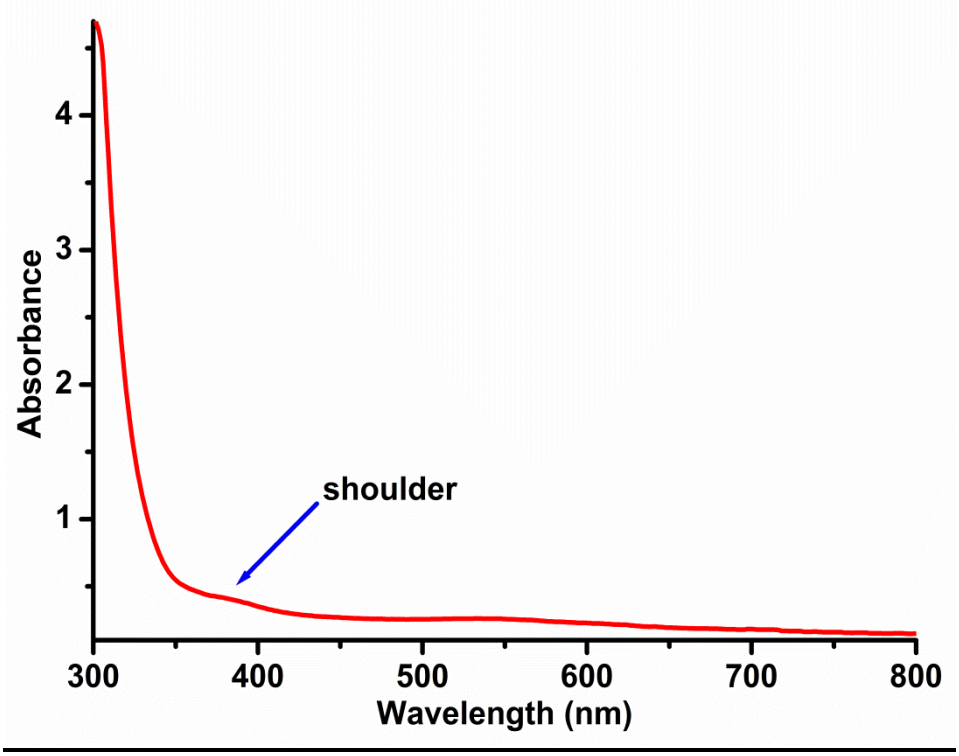


Fig. S10: UV-Vis. spectrum of the mixture ([Cu(Si-NH_2-DPED)Cl_2], H_2O_2, HNO_3 and CH_3CN)

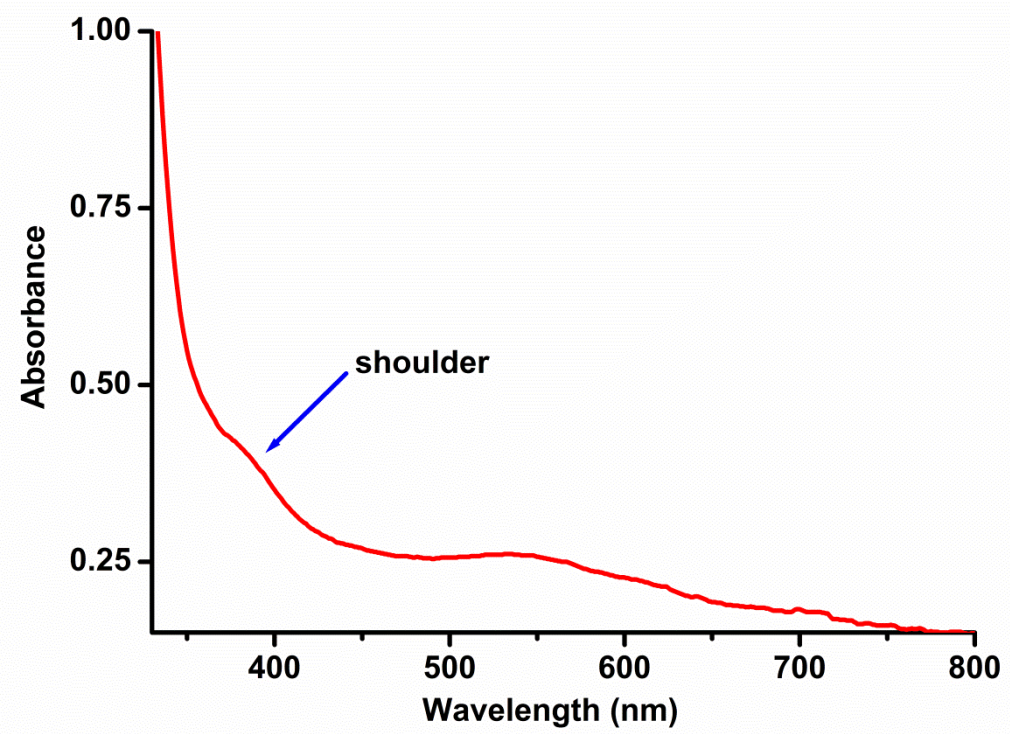


Fig. S11: Magnified UV-Vis. spectrum of the mixture ([Cu(Si-NH_2-DPED)Cl_2], H_2O_2, HNO_3 and CH_3CN)

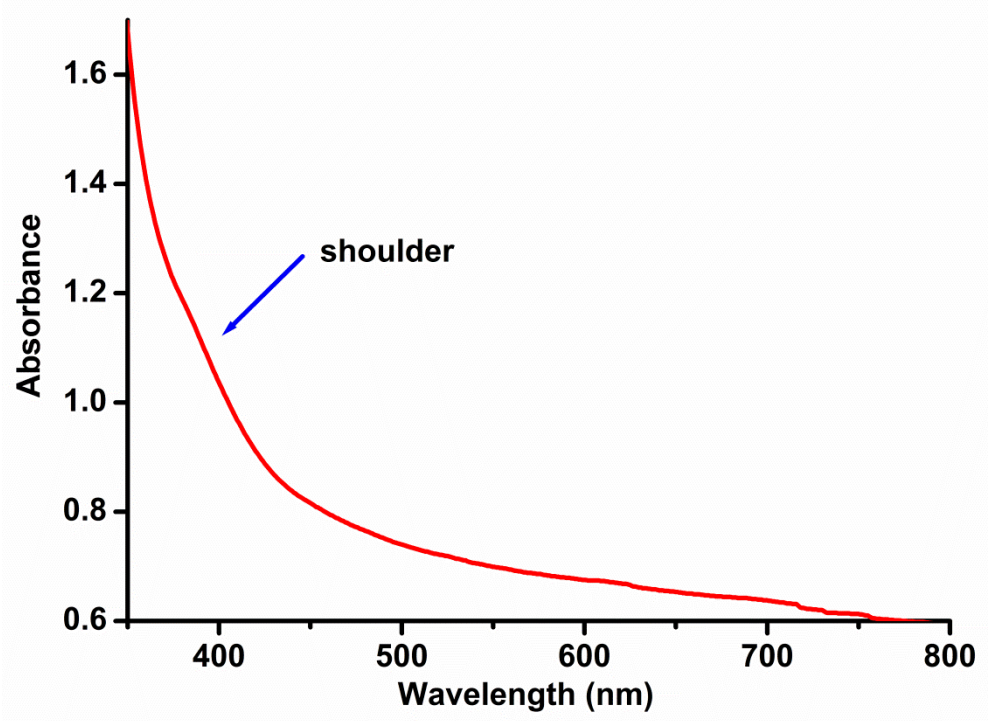


Fig. S12: UV-Vis. spectrum of the mixture ([Co(Si-NH_2-DPED)Cl_2], H_2O_2, HNO_3 and CH_3CN)

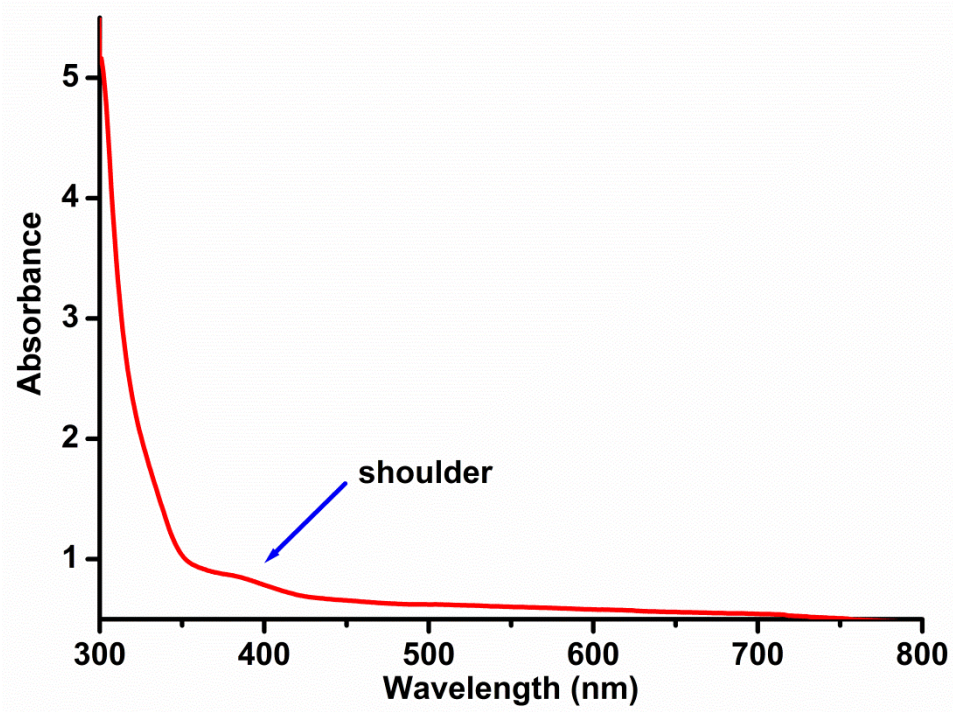


Fig. S13: UV-Vis. spectrum of the mixture ([Ni(Si-NH_2-DPED)Cl_2], H_2O_2, HNO_3 and CH_3CN)

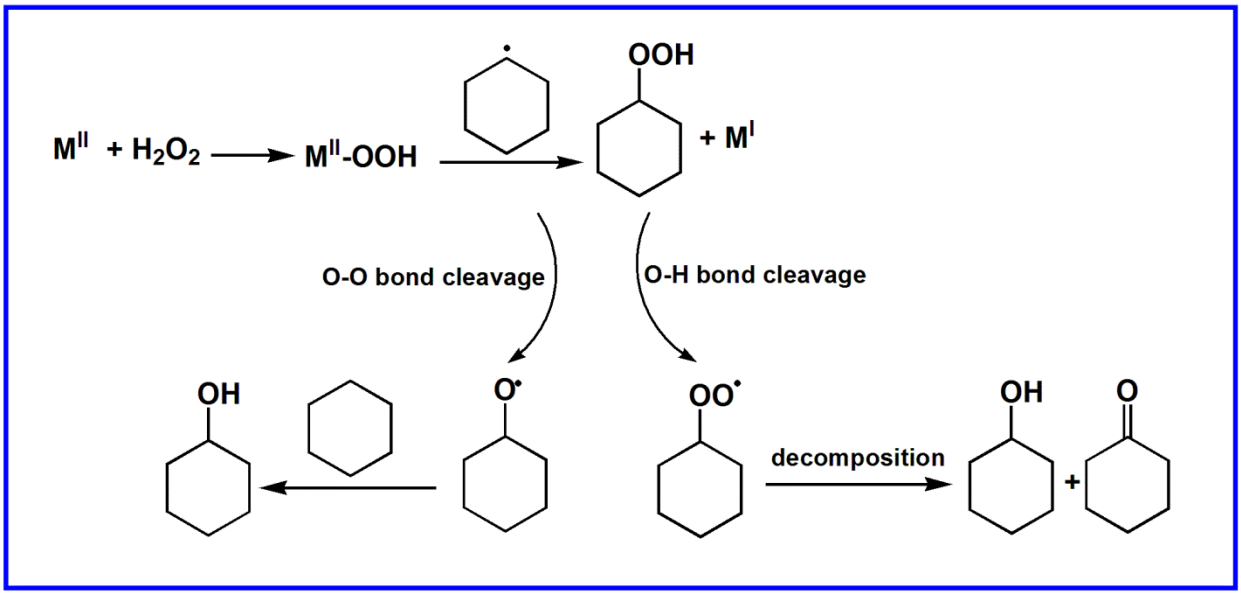


Fig. S14: Peroxidative mechanism of cyclohexane oxidation