Graphical abstract

CO + O$_2$

Au

α-Fe$_2$O$_3$

5 nm
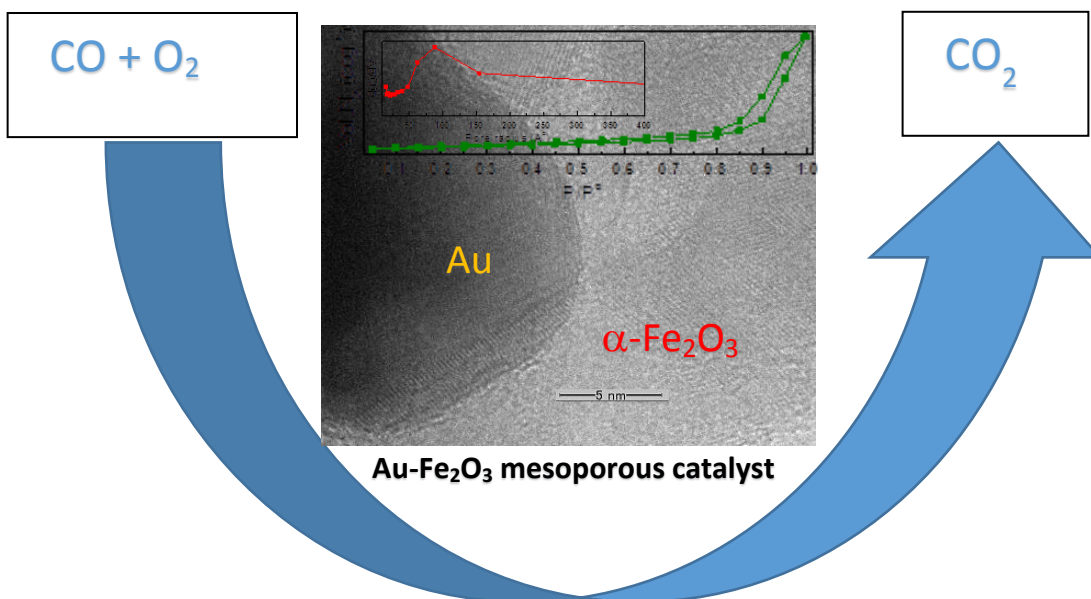
Au-Fe$_2$O$_3$ mesoporous catalyst

CO$_2$

Table S1: Quantification of elemental species using XPS analysis

Sample name	Name of the region	Position of Peak (eV)	Atomic concentration (%)
0.1Au-Fe	O1s_1	529.1	14.28
	O1s_2	530.7	61.54
	O1s_3	533.0	7.20
	Fe2p$_{3/2}$_1	709.2	0.32
	Fe2p$_{3/2}$_2	712.1	16.62
	Au 4f$_{7/2}$	84.2	0.02
0.2Au-Fe			
	O1s_1	529.0	17.13
	O1s_2	530.4	55.14
	O1s_3	533.0	8.90
	Fe2p$_{3/2}$_1	709.6	0.36
	Fe2p$_{3/2}$_2	711.6	14.78
	Au4f$_{7/2}$	83.4	0.04
0.5Au-Fe			
	O1s	528.7	20.76
	O1s	530.2	54.07
	O1s	533.0	14.33
	Fe2p$_{3/2}$_1	709.3	0.28
	Fe2p$_{3/2}$_2	711.7	14.12
	Au4f$_{7/2}$	83.5	0.05
1.0Au-Fe			
	O1s	528.7	4.01
	O1s	530.0	49.18
	O1s	533.0	34.49
	Fe2p$_{3/2}$_1	708.7	0.22
	Fe2p$_{3/2}$_2	711.2	11.31
	Au4f$_{7/2}$_Au$^{\mathrm{o}}$	83.0	0.01
	Au4f$_{7/2}$_Au$^{\delta+}$	84.2	0.05

Table S2: Quantitative results of H$_2$ consumption for catalysts in H$_2$-TPR analysis

S. No.	Catalyst	H$_2$ uptake (mmol g^{-1})
1	α-Fe$_2$O$_3$	448
2	0.1Au-Fe	464
3	0.2Au-Fe	489
4	0.5Au-Fe	525
5	1.0Ag-Fe	566