Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting Information

Title : Fabrication of Au loaded $CaFe_2O_4$ / CoAl LDH p-n junction based achitecture with stoichoimetric H_2 & O_2 generation and Cr(VI) reduction under visible light

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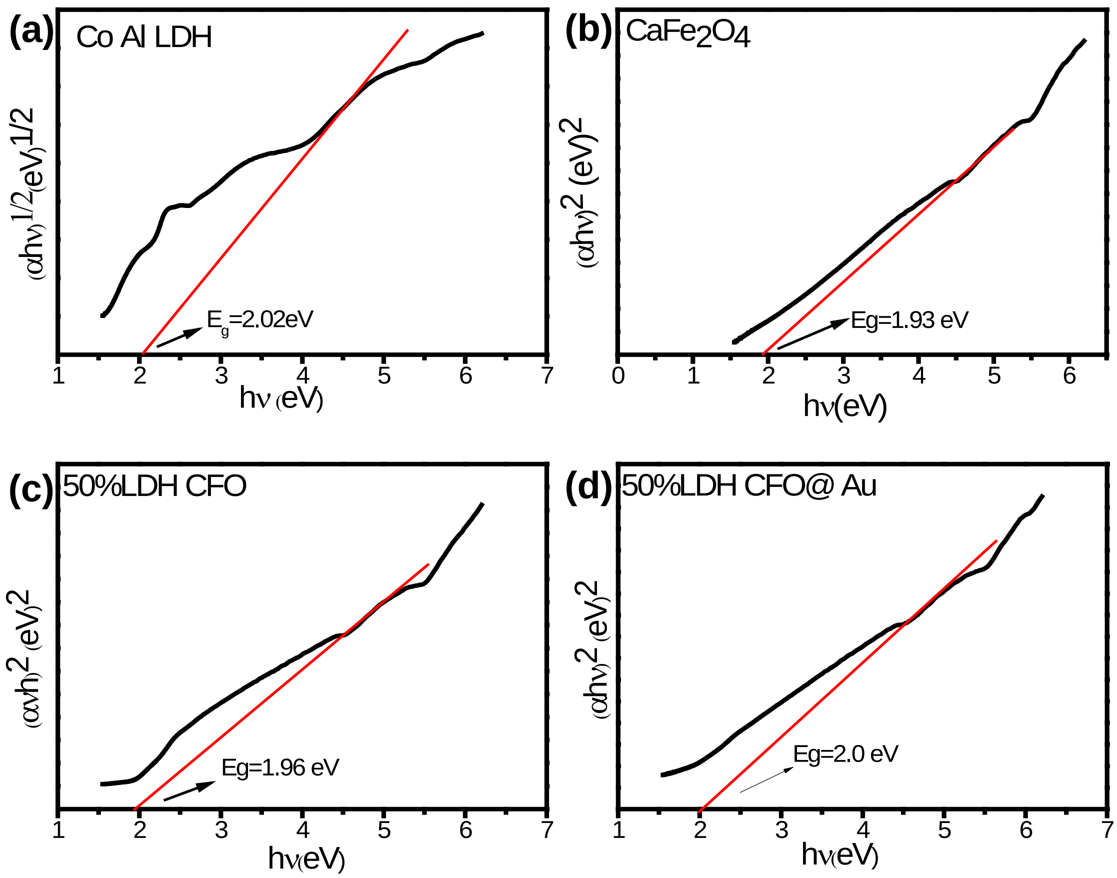

Fig. S1 Band gap energy values estimated from UV-vis DRS of (a) neat Co Al LDH, (b) CFO, (c) 50% LDH-CFO and (d) 50% LDH-CFO@Au .

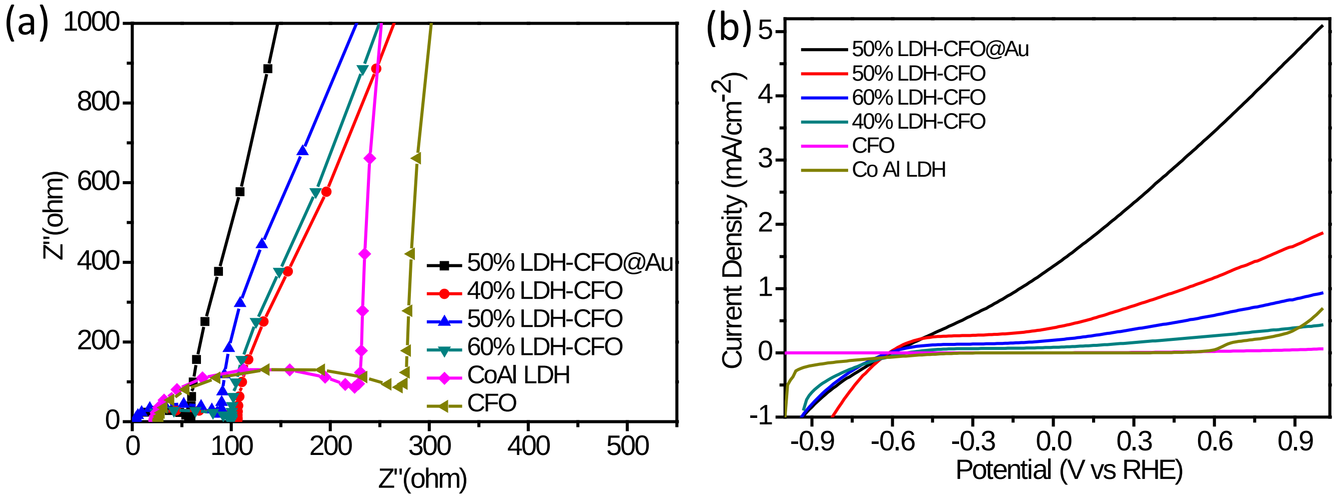

Fig. S2 Electrochemical impedance spectra (EIS) (a) and polarisation curve (b) of all synthesized samples under visible light irradiation.

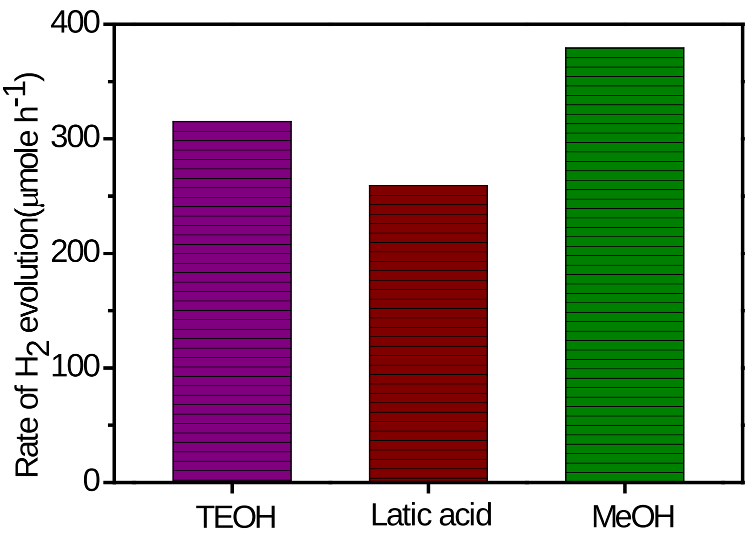

Fig. S3 H_2 production study of LDH-CFO@Au heterostructure using various scavenger component.

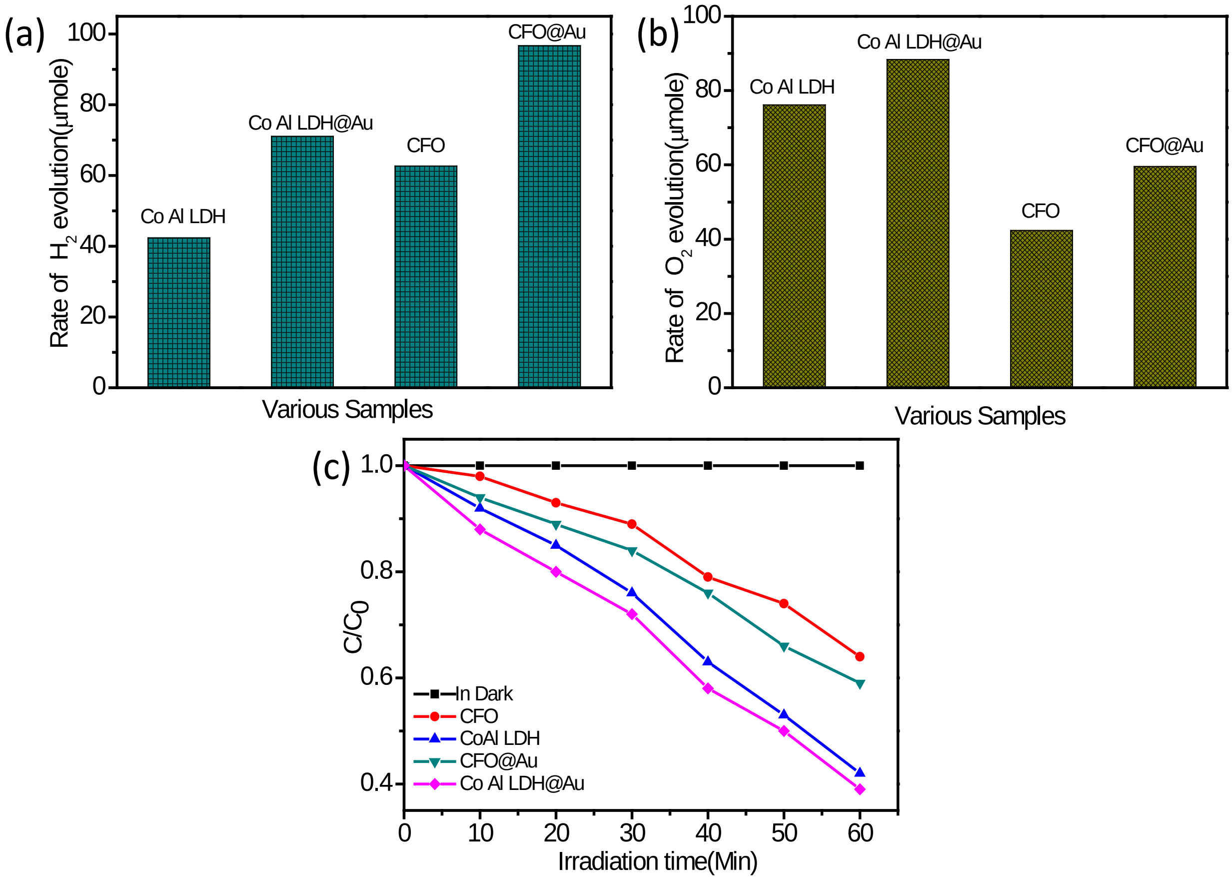

Fig.S4 Rate of H_2 production (a), O2 production (b) and Cr reduction (c) of neat LDH, CFO and Au loaded LDH, CFO.

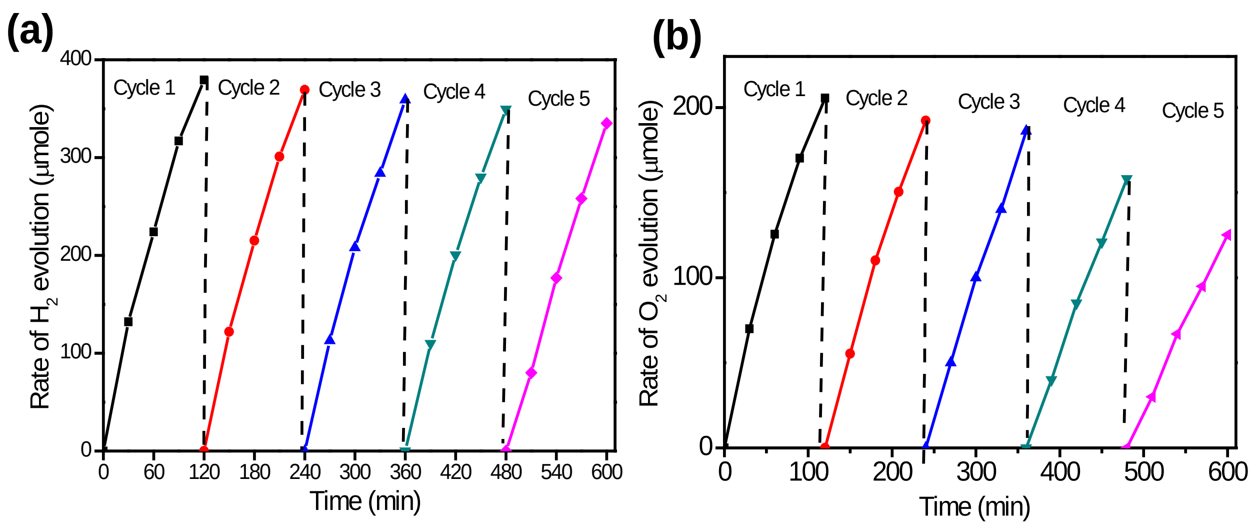

Fig. S5 Cycling test for H_2 (a) and O_2 (b) evolution of LDH-CFO@ Au.

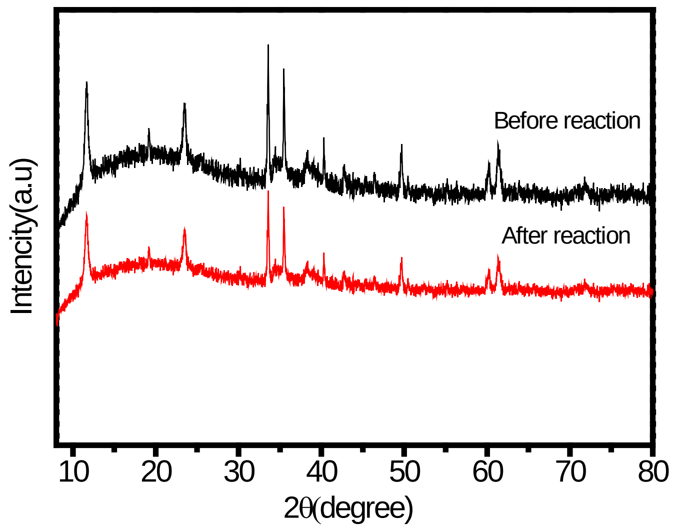

Fig. S6 XRD plot of 50%LDH-CFO before and after photocatalytic reaction.

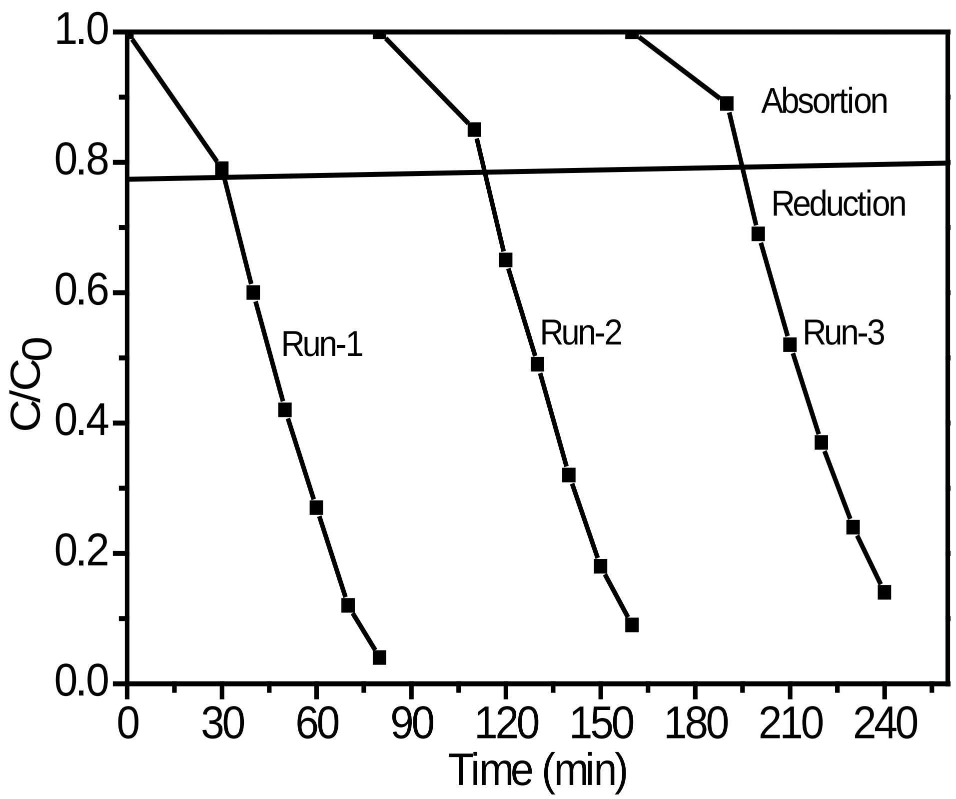

Fig. S7 Reusability study of Cr(VI) reduction over 50% LDH-CFO @Au

Table S1. Values of H_2 Evolution by Different LDH-modified Nano composites

Catalytic system	UV-vis light Source	Preparation Method	Incident light	Sacrificial agents	H2 evolution (μ mol $g^{-1}h^{-1}$)	Ref.
FeMgAl LDH	125 W mercury	coprecipitation	λ> 420	CH3OH	493	4
CdSe/ZnCr LDH	450 W Xenon	Expoliation	λ> 420	Na_2So_3+Na_2S	374	5
CdZnS/ZnCr LDH	300 W Xenon	hydrothermal	λ> 420	CH_3OH	18320	6
NiZnCr LDH	125 W mercury	coprecipitation	λ> 420	CH_3OH	1915	7
CeO2-MgAl LDH	125 W mercury	In situ	λ> 420	CH_3OH	16483	8
50% CoAl LDH-CaFe2O4	150 W Xenon	Co-Precipitation followed by sol gel	λ> 420	CH_3OH	17120	Present work

50% CoAl LDH-CaFe2O4@Au	150 W Xenon	Co-Precipitation followed by sol gel	λ> 420	CH_3OH	18955	Present work

Table S2. Values of O_2 Evolution by Different LDH-modified Nano composites

Catalytic system	UV-vis light Source	Preparation Method	Incident light	Sacrificial agents	O2 evolution (µ mol $g^{-1}h^{-1}$)	Ref.
TbZnCr-LDH	200 W Xenon	Hydroyhermal followed by co-precipitation	λ> 420	$AgNO_3$	1022	9
ZnCrLDH/layered TiO_2	150 W Xenon	Layer by layer	λ> 420	$AgNO_3$	1180	10
ZnCr LDH/RGO	450 W Xenon	Self-assembly		$AgNO_3$	1200	11
ZnCr LDH/POM	405 W Xenon	self-assembly	λ> 420	$AgNO_3$	2400	12
TiO_2@CoAl LDH	300W Xenon	In situ growth	λ> 420	$AgNO_3$	2240	13
50% CoAl LDH-$CaFe_2O_4$	150 W Xenon	Co-Precipitation followed by sol gel	λ> 420	$AgNO_3$	14126	Present search
50% CoAl LDH-$CaFe_2O_4$@Au	150 W Xenon	Co-Precipitation followed by sol gel and reduction	λ> 420	$AgNO_3$	10275	Present search

Table S3. Rate of Cr(VI) reduction over 50% LDH-CFO@ Au heterostructure with other reported materials

Catalytic system	Concentration of Cr(VI)	Light source	Preparation method	Catalytic activity time(h)	pH	Results (%)	refs
FeOOH/RGO	10 ppm	Visible light	in situ hydrothermal	3	2	94	1
MnO2@RGO	10 ppm	Visible light	in situ hydrothermal	2	2	97	2
Ag@Ag3PO4/g-C3N4/NiFe LDH	20ppm	Visible light	Electrostatic self-assembly and insitu photoreduction	2	5	97	3
50% CoAl LDH-CaFe2O4@Au	20ppm	Visible light	Co-Precipitation followed by sol gel and reduction	1	4	99.03	Present work

Table S4 Regression co-efficient (R^2) and rate constant (k) values of the synthesized samples in Cr(VI) reduction

Sample	Regression Co-efficient (R^2)	Rate constant (k)
In the dark	-------	0
Co Al LDH	0.95	0.014
CaFe2O4	0.91	0.007
40% LDH-CFO	0.93	0.021
50% LDH-CFO	0.97	0.031
60% LDH-CFO	0.95	0.027
50% LDH-CFO@Au	0.98	0.048

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