Ag-NiP Deposited Green Carbon Channels Embedded NiP Panels for Sustainable Water Splitting

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Table S1: Comparison of the Electrocatalytic Oxygen Evolution Reaction (OER) Activity of the Present System (Ag-CL/NiP) with Ni and Carbon-Based Catalysts Reported Recently

Sl. No.	Name of the catalyst	OER over potential at 10 mA cm^{-2}	Ref
	Ag-C/Ni-P	150mV	Current Work
1.	Fe doped$Ni_3Fe/NiFe_2O_4$/CNT	250mV	[1]
2.	$Ni_3Fe/NiFe_2O_4$@N-GT	230mV	[2]
3.	NiO-$NiFe_2O_4$/rGO	296mV	[3]
4.	$Fe_2O_3/NiFe_2O_4$@CNFs	350mV	[4]
5.	Ni-$NiFe_2O_4$@C	212mV	[5]
6.	NiFe-LDH@CNT	269mV	[6]
7.	N doped Graphene/$NiFe_2O_4$	340mV	[7]
8.	$NiFe_2O_4$/Ketjenblack Carbon	258mV	[8]
9.	Ni_xFe-S/$NiFe_2O_4$/3DCarbon	248mV	[9]
10.	Te-$NiFe_2O_4$@Carbon/NF	220mV	[10]

Table S2: Comparison of Photocatalytic Hydrogen Evolution Performance of the Present System (Ag-CL/NiP) with Recently Reported Catalysts

Sl. No.	**Name of catalyst**	**Hydrogen evolution rate**	**Photo current**	**Ref**
	Ag-C/Ni-P	**4.37 mmolcm^{-2}h^{-1}**	**9.42 mA cm^{-2}**	**Current work**
1	Cu_xO/TiO_2	7.06 mmolh^{-1}g^{-1}.	3.641 µA cm^{-2}	[11]
2	Ni_2P/NiS@PCOS	150.7 µmolh^{-1}	155 µA cm^{-2}	[12]
3	Et-GaAs/TiO_2/Ni-P	-	25 mA cm^{-2}	[13]
4	CdS@Ni_3S_2	178.1 µmolcm^{-2}h^{-1}	10.8 mA cm^{-2}	[14]

5	WO_3/CuO	-	3.2 mA cm^{-2}	[15]
6	C-$BiVO_4$/CQDs	50 µmolh^{-1}	4.83 mA cm^{-2}	[16]
7	$BaTiO_3$	6.72 µmol$cm^{-2}h^{-1}$	0.17 mA cm^{-2}	[17]
8	(Co-Ci/NiFeOOH/$BiVO_4$	56.66 µmolh^{-1}	4.1 mA cm^{-2}	[18]
9	Ti-Fe_2O_3/In_2O_3	-	2 mA cm^{-2}	[19]
10	Co-Pi/CQDs/Fe_2O_3/TiO_2	-	3.0 mA cm^{-2}	[20]

1. Physico - chemical characterization

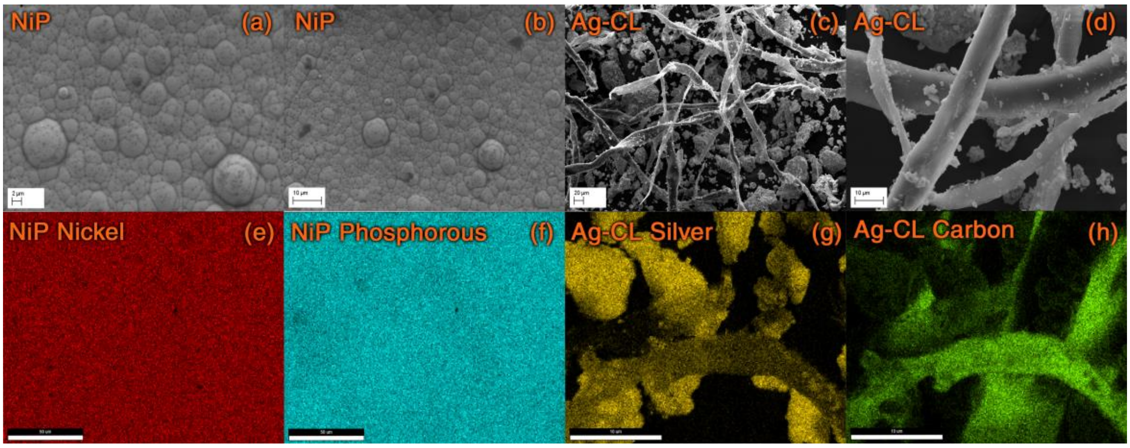

Figure S1: SEM images of (a – c) Ag-CL powder at different magnifications and EDAX mapping of (d- h) Ag-CL powder

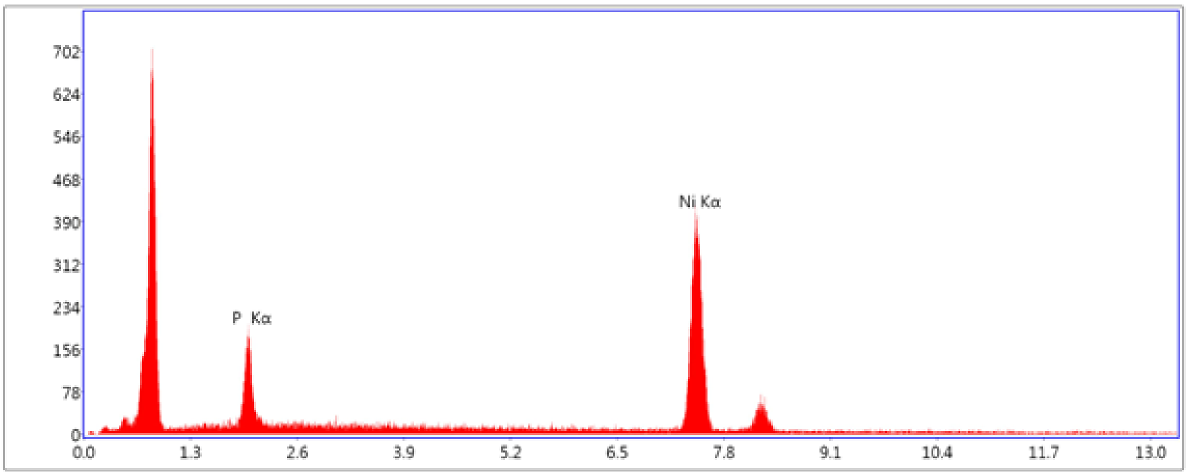

Figure S2: EDAX spectra of NiP panel

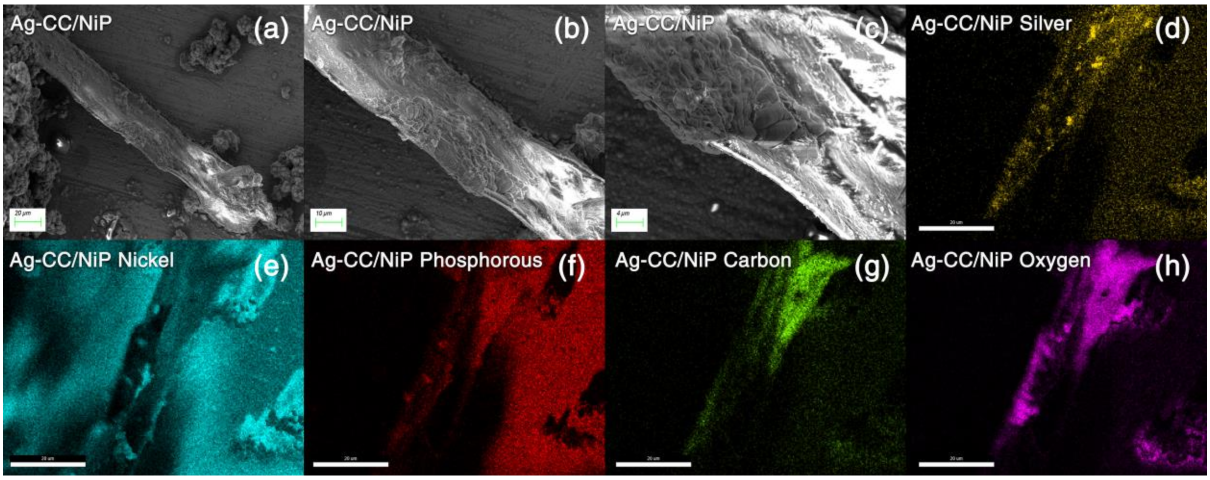

Figure S3: FE-SEM images of (a – c) Ag-CC/NiP at different magnifications and EDAX mapping of (d- h) Ag-CC/NiP panel

2. Electrocatalytic Oxygen Evolution Reaction (OER) Analysis

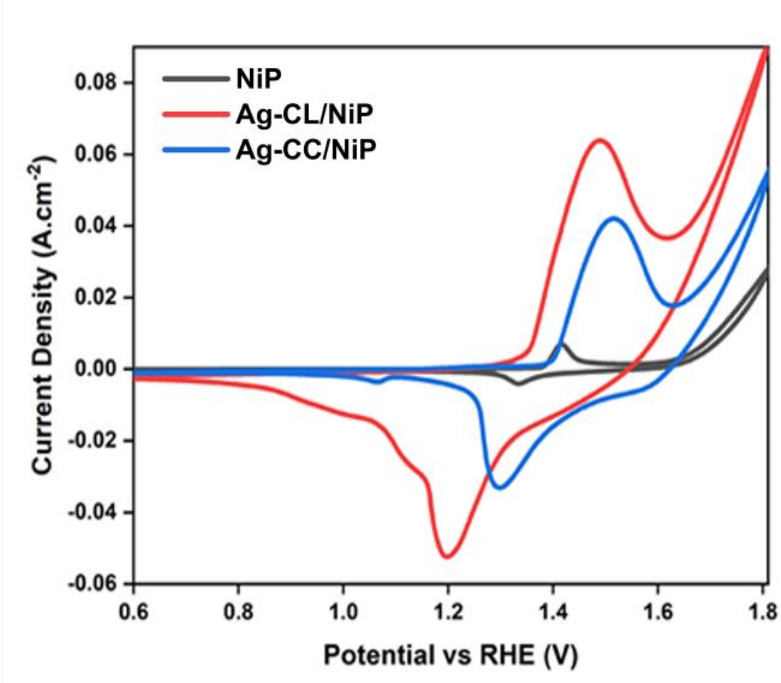

Figure S4: CV analysis of different electrodes at 10 mV/s scan rate in 1M NaOH electrolyte

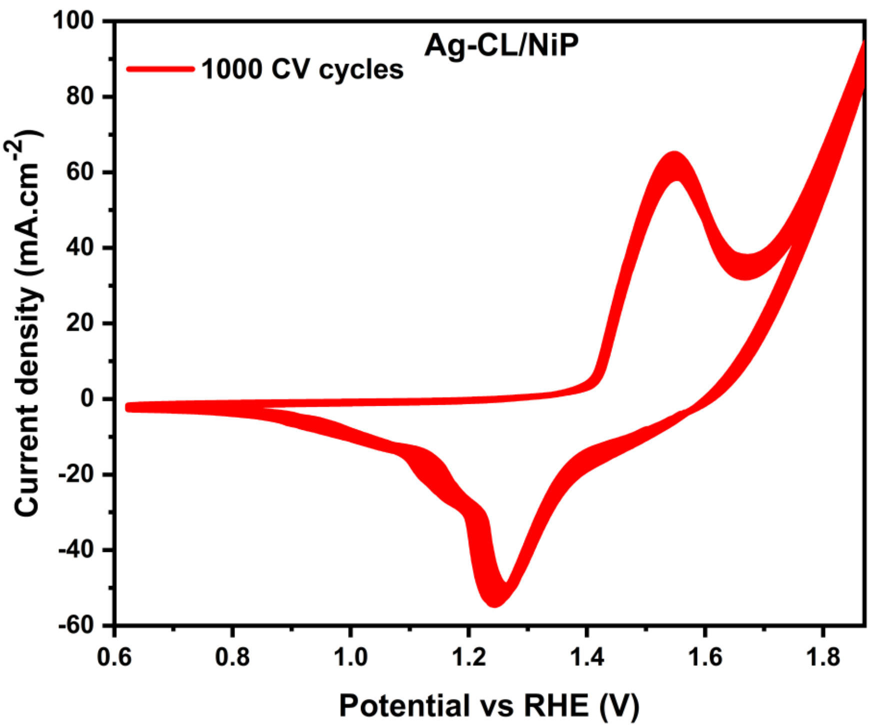

Figure S5: Stability analysis by 1000 cycles of CV at 10 mV/s scan rate in 1M NaOH electrolyte

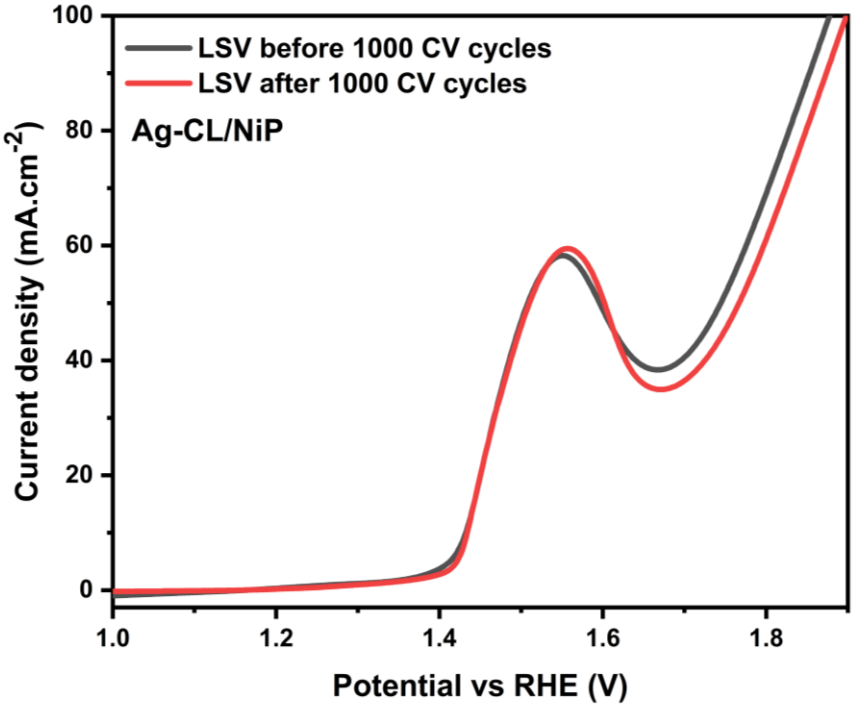

Figure S6: LSV curve before and after 1000 cycles of CV at 10 mV/s scan rate in 1M NaOH electrolyte

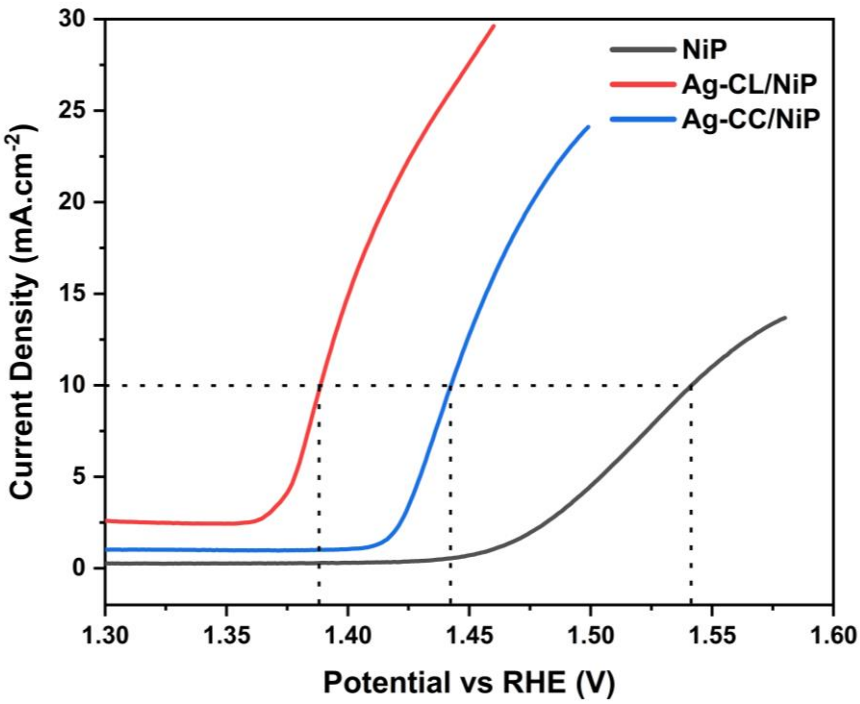

Figure S7: LSV curves at 10 mV/s scan rate in 1M NaOH electrolyte, evidenced initiation of electrocatalytic OER before 1.4 V vs RHE

3. Photocatalytic Water Splitting Analysis

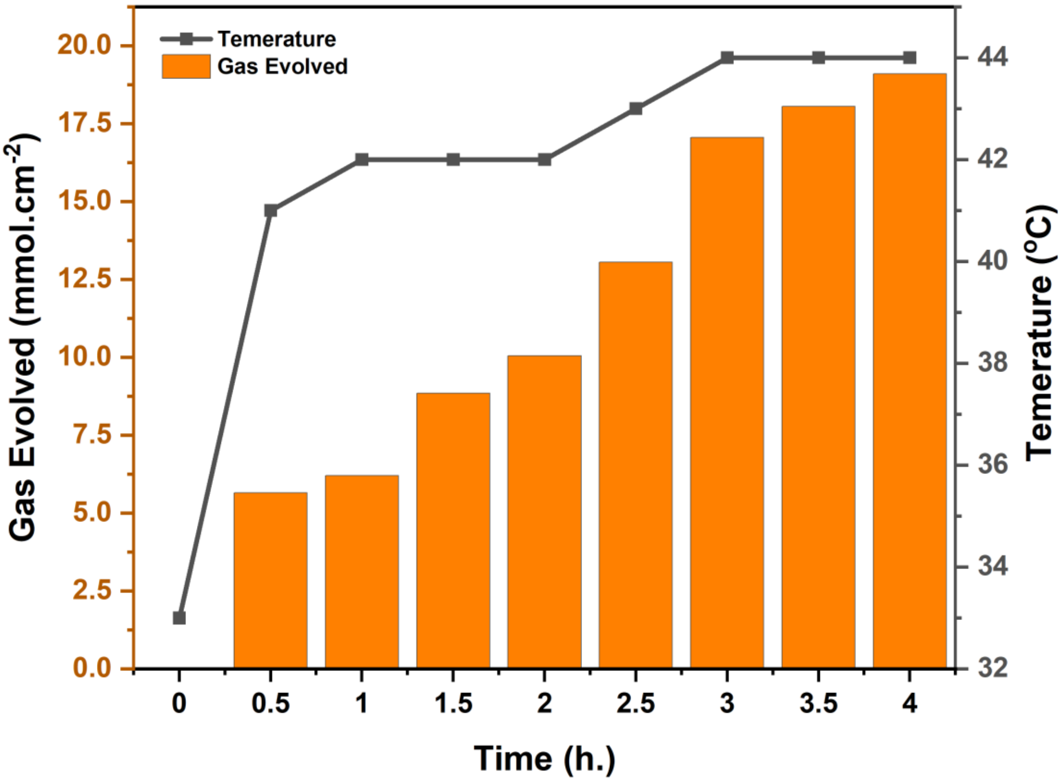

Figure S8:Variation in the hydrogen evolution performance with temperature fluctuations over time during photocatalytic water splitting of Ag-CL/NiP.

4. Reusability and stability

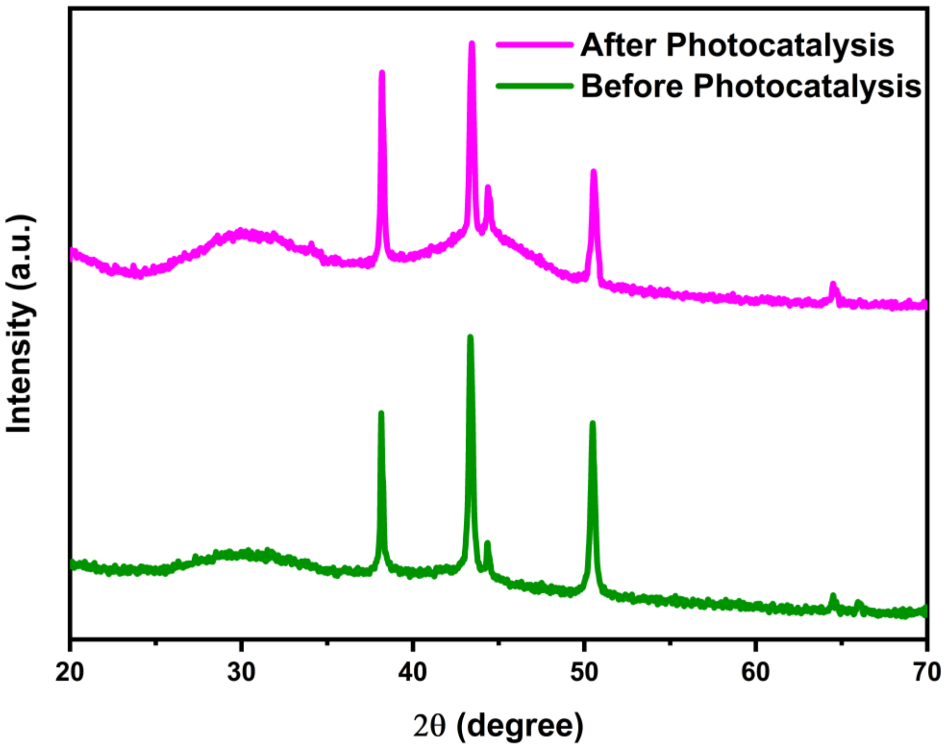

Figure S9 XRD pattern of Ag-CL/NiP before and after 5 cycles of photocatalytic water splitting

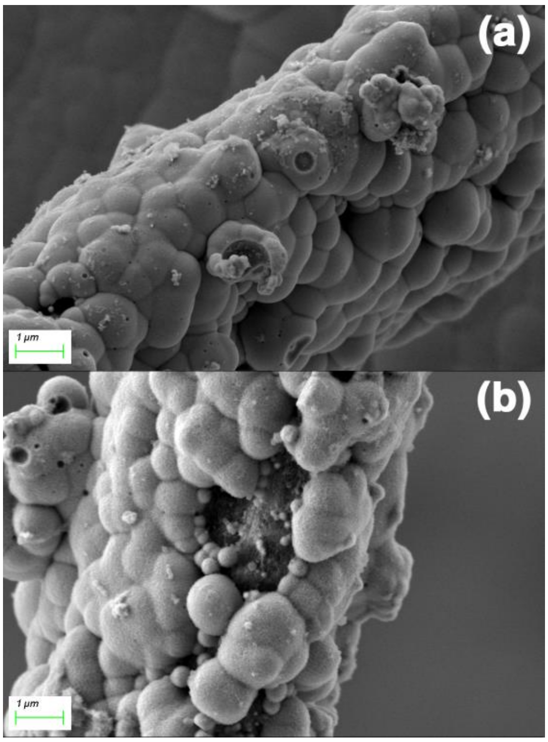

Figure S10 FESEM images of Ag-CL/NiP before and after 5 cycles of photocatalytic water splitting

Apparent Quantum Yield

The apparent quantum yield (AQY) of Ag-CL/NiP catalysts was calculated by using the following equation SE1 given below,

AQY (%) = (2 X no. of H_2 molecules)/(Number of incident photons) x 100 ……………………………….SE1[21]

Under the assumption that field effect and multiple excitation has no contribution to H_2 generation.

For 9% photons from the wavelength range 370–500 nm are incident the no. of photons absorbed = 8.084×10^{18} $s^{-1}cm^{-2}$

AQY (%) = (2 x no. of H_2 molecules)/(Number of incident photons) x 100

= 1.8×10^{-2} %

The apparent quantum yield (AQY) of Ag-CL/NiP catalysts used for photocatalysis at ~12 ^{o}C

= 1.04×10^{-2} %

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