Supplementary Materials

rGO Wrapped Trimetallic Sulfide Nanowires as Efficient Bifunctional Catalyst for Electrocatalytic Oxygen Evolution and Photocatalytic Organic Degradation

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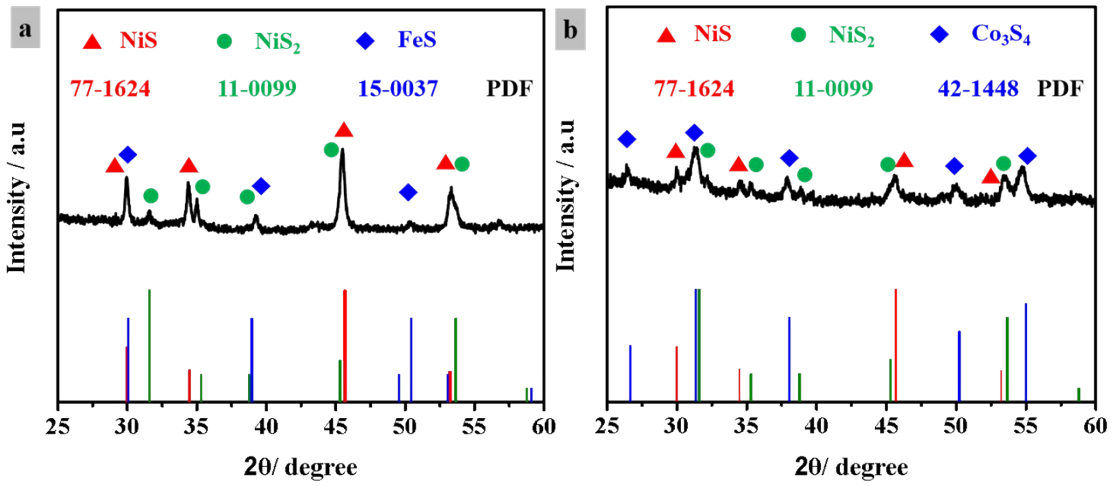

Fig. **S1**. XRD pattern of the Ni-Co-S-**160**/rGO and Ni-Fe-S-**160**/rGO.

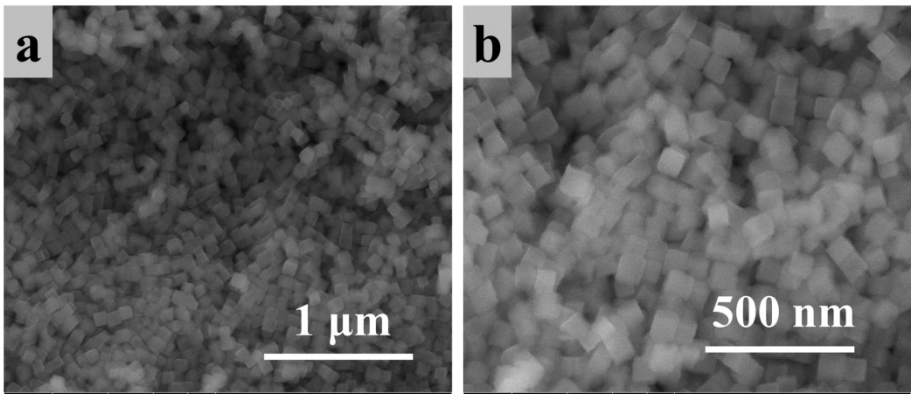

Fig. **S2**. The SEM images of precursor Ni-Co-Fe-PBA/GO.

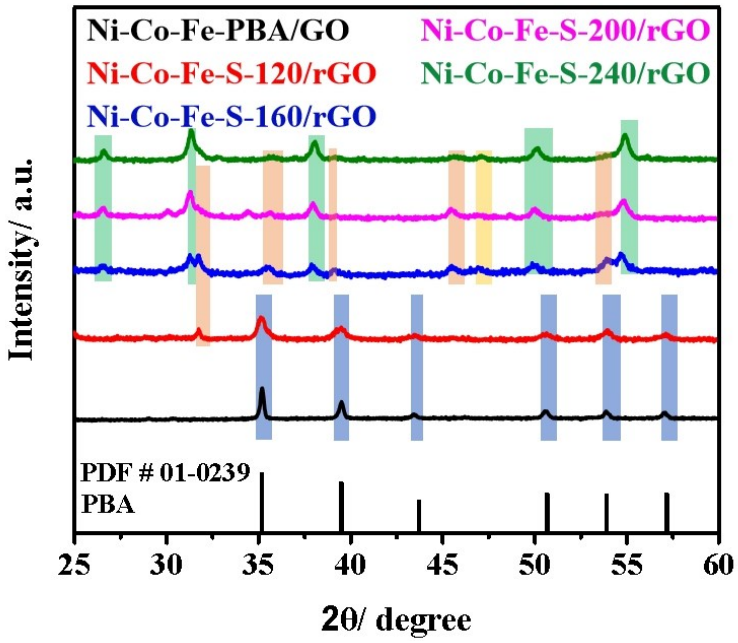

Fig. **S3**. The XRD patterns of Ni-Co-Fe-PBA/GO, Ni-Co-Fe-S-**120**/rGO, Ni-Co-Fe-S-**160**/rGO, Ni-Co-Fe-S-**200**/rGO, Ni-Co-Fe-S-**240**/rGO.

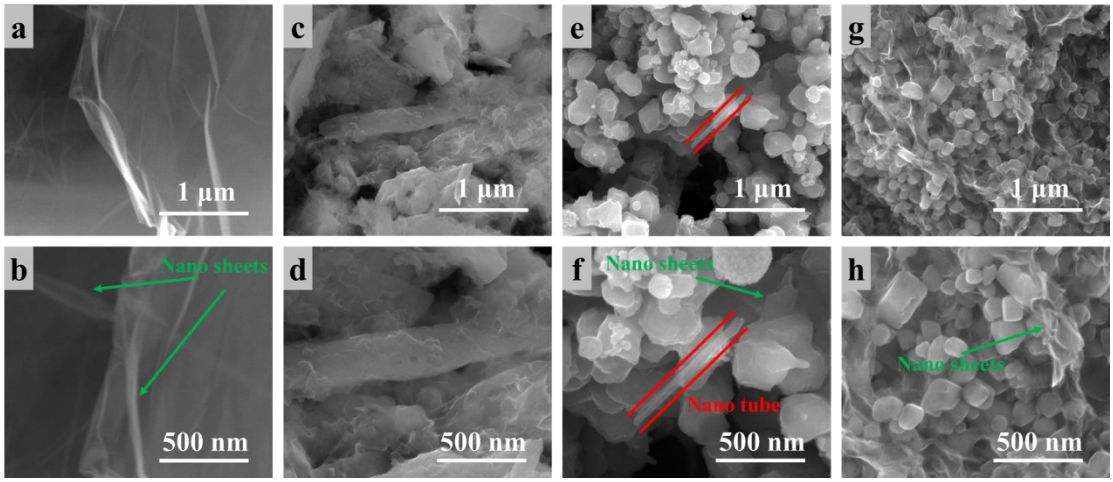

Fig. **S4**. The SEM images of a, b) GO, c, d) Ni-Co-Fe-S-**160**, e, f) Ni-Co-S-**160**/rGO and g, h) Ni-Fe-S-**160**/rGO

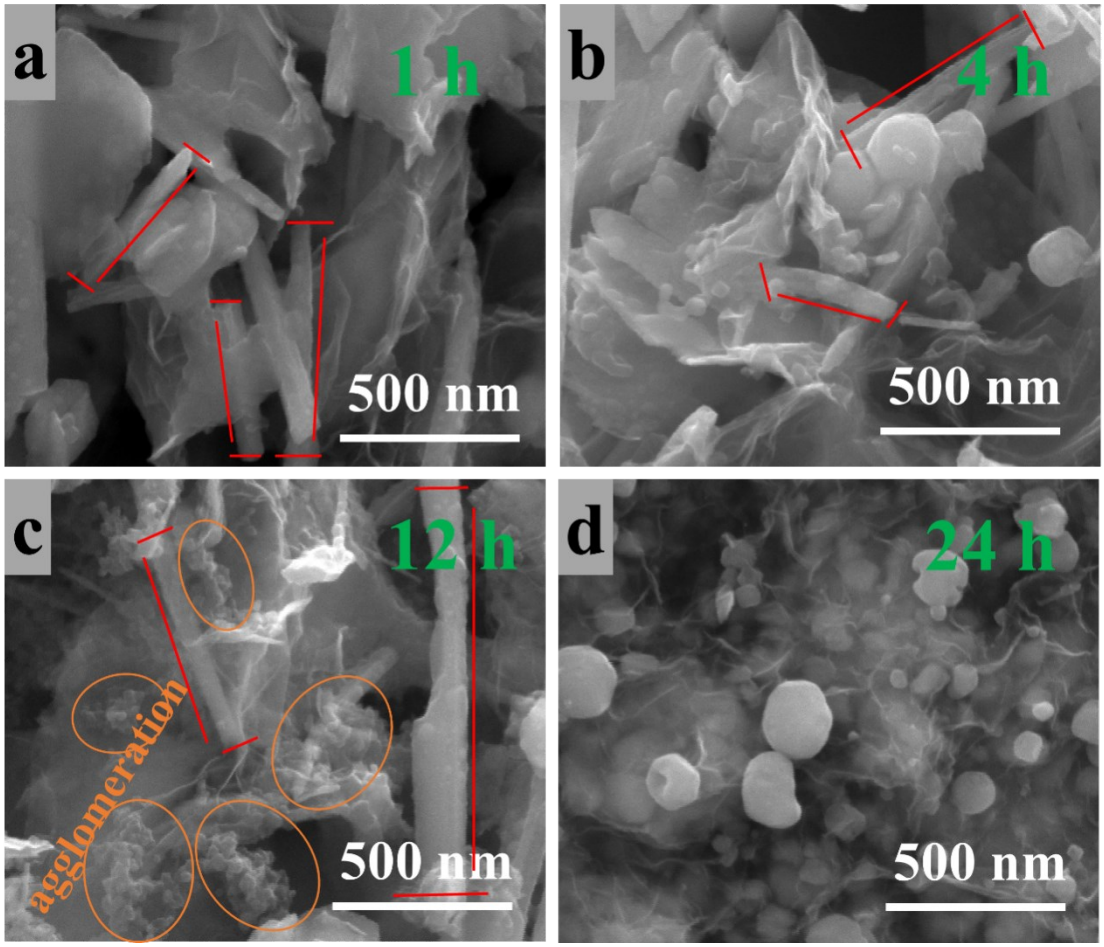

Fig. **S5**. The SEM images of Ni-Co-Fe-S-**160**/rGO with different reaction times a) 1 h, b) 4 h, c) 12 h and d) 24 h.

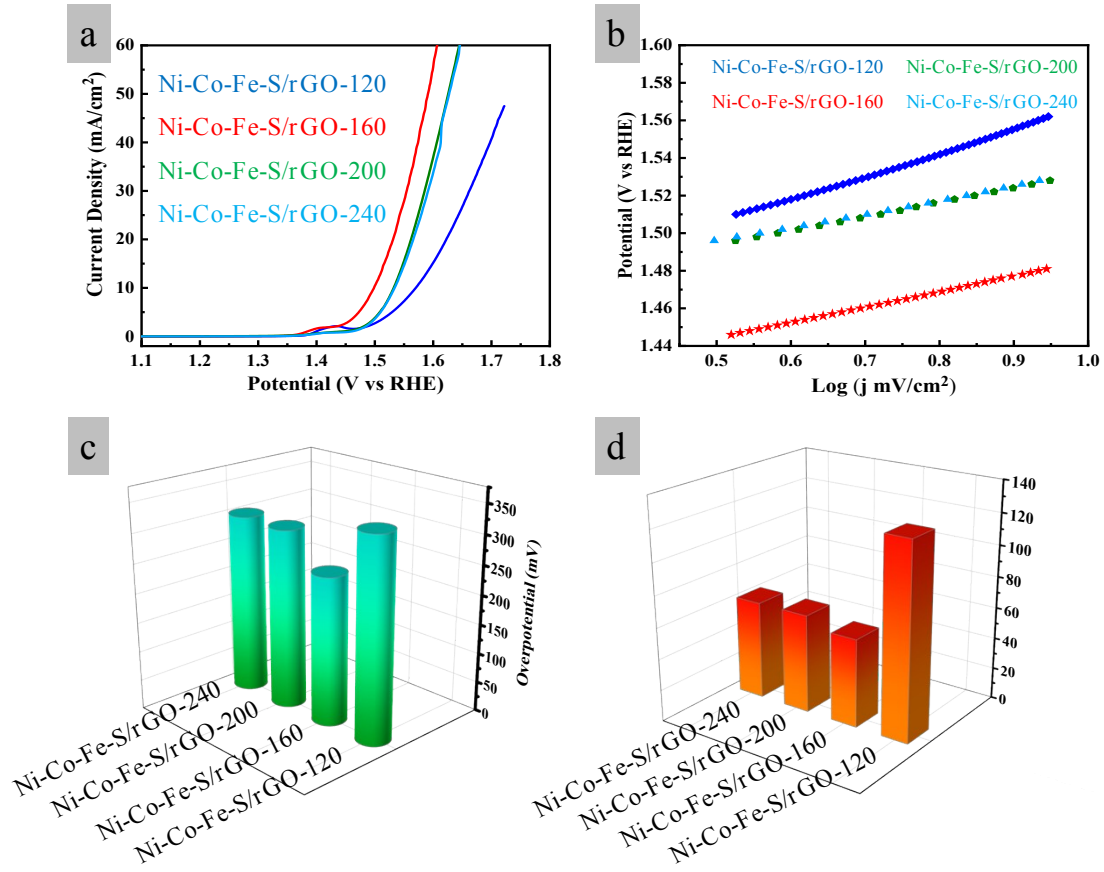

Fig. S6. a) Polarization curves, b) Tafel plots and c, d) performance comparison of the Ni-Co-Fe-S/rGO-**120**, Ni-Co-Fe-S/rGO-**160**, Ni-Co-Fe-S/rGO-**200** and Ni-Co-Fe-S/rGO-**240**.

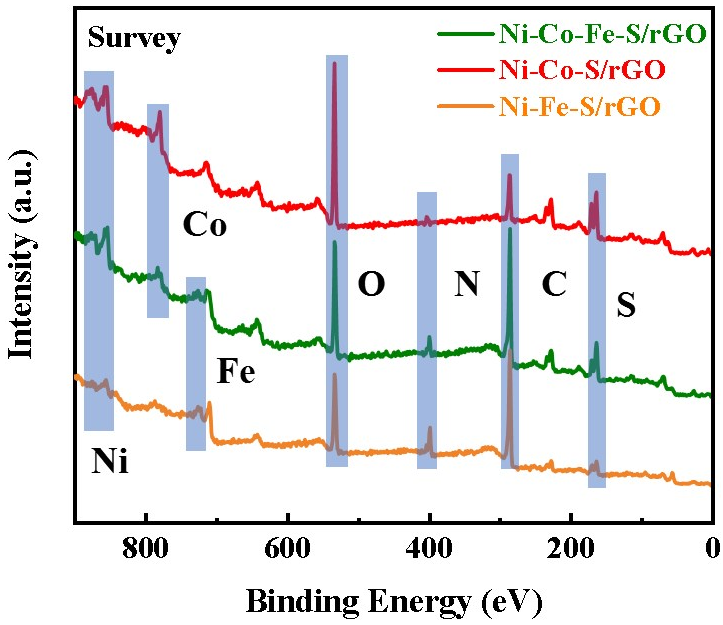

Fig. **S7**. XPS survey curve of the Ni-Co-Fe-S/rGO, Ni-Co-S/rGO and Ni-Fe-S/rGO.

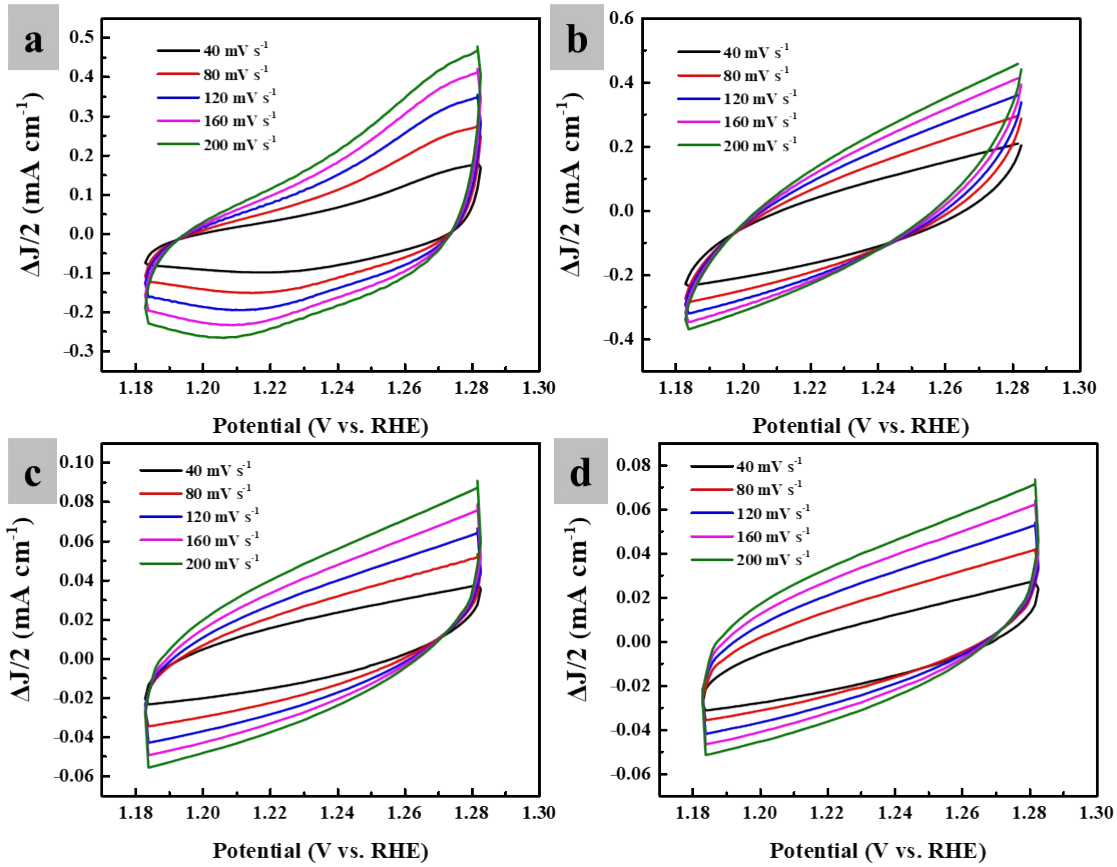

Fig. **S8**. Voltammograms of the a) Ni-CoFe-S/rGO, b) Ni-CoFe-S, c) Ni-Co-S/rGO and Ni-Fe-S/rGO for OER.

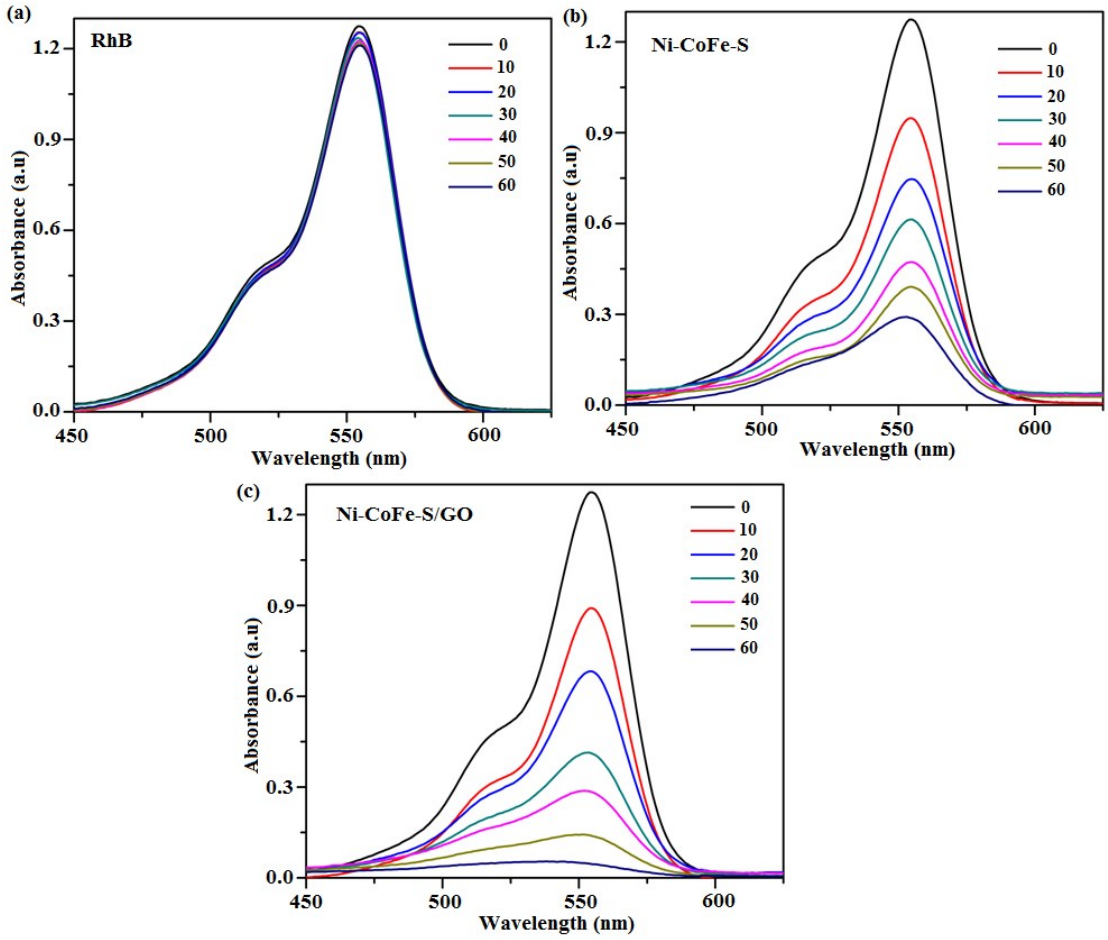

Fig. **S9**. UV-visible spectra of a) RhB, Ni-Co-Fe-S and Ni-Co-Fe-S/rGO vs. illumination time.

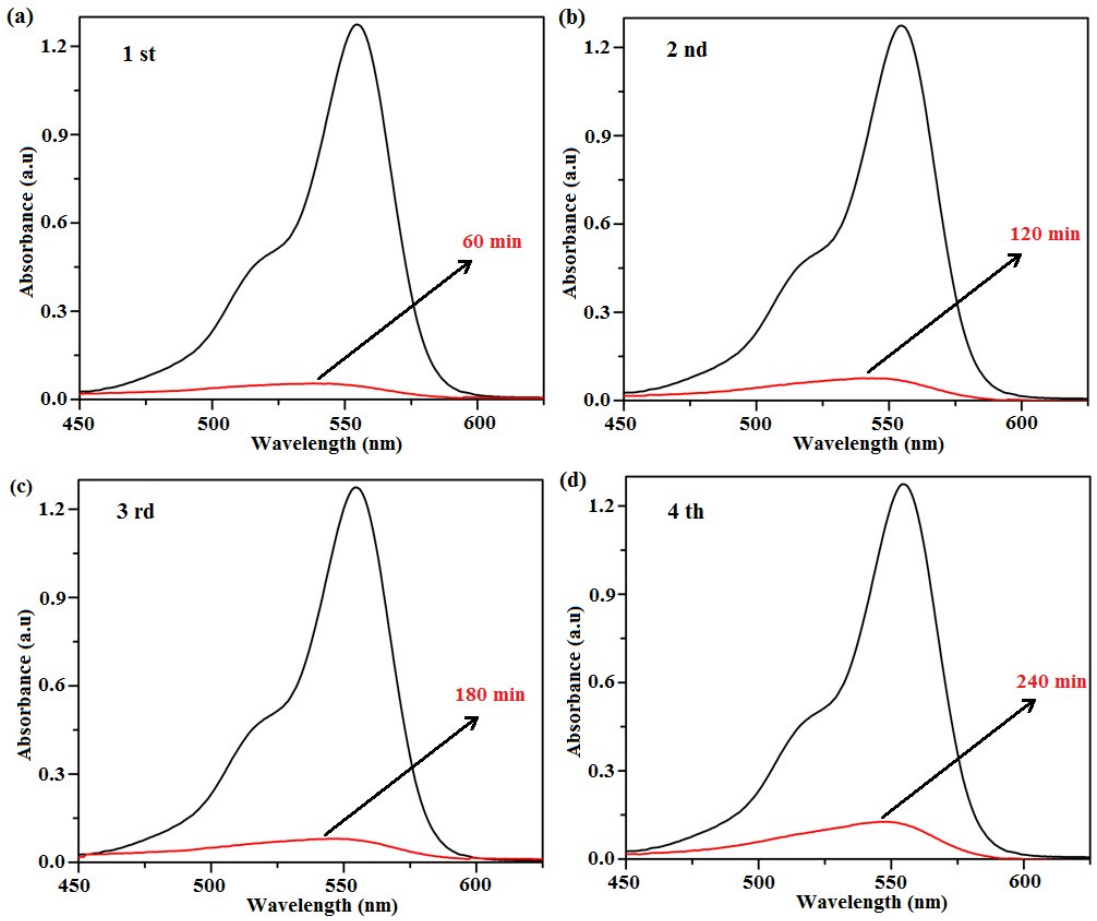

Fig. **S10**. UV-visible spectra of Ni-Co-Fe-S/GO with different illumination time.

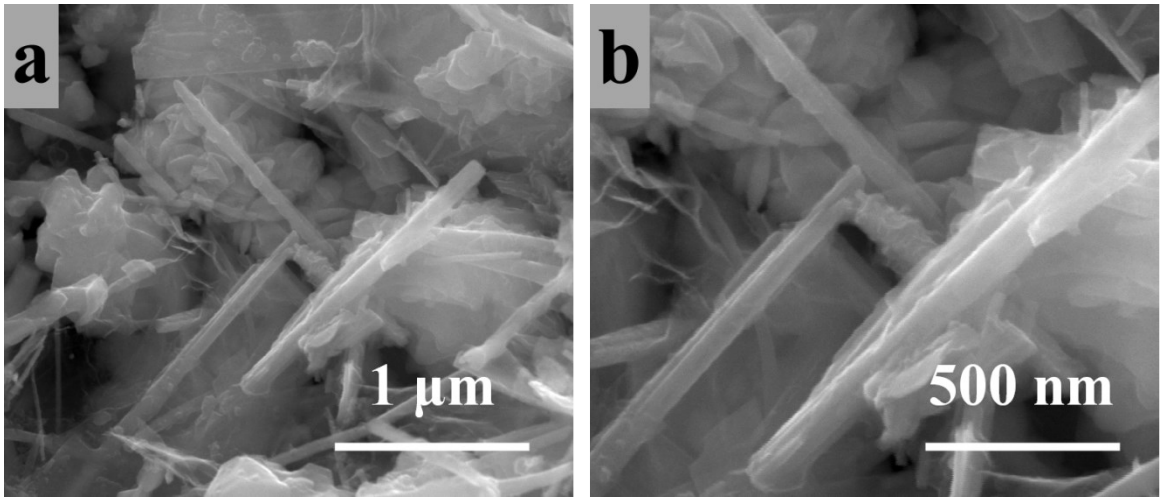

Fig. **S11**. SEM images after photo-catalytic degradation process.

Tab. **S1**. The atomic percent of S, Ni, Co and Fe from EDS and ICP-OES analysis.

Characterization Method	Atomic Ratio (%)			
	S	Ni	Co	Fe
EDS	58.2	25.2	6.4	10.2
ICP-OES	60.3	23.6	6.2	9.9

Tab. **S2**. The XPS peak position of Ni-Co-Fe-S/rGO, Ni-Co-S/rGO and Ni-Fe-S/GO.

Catalysts	**Peak position (eV)**					
	Ni-S	**Ni^{2+}/Ni^{3+}**	**Co-S**	**Fe^{2+}/Fe^{3+}**	**S $2p_{1/2}$**	**S $2p_{3/2}$**
Ni-Co-Fe-S/rGO	852.62	855.93	778.06	710.88	161.85	160.70
Ni-Co-S/rGO	853.09	856.76	778.32	/	161.64	160.52
Ni-Fe-S/rGO	852.46	855.93	/	709.70	162.01	160.89