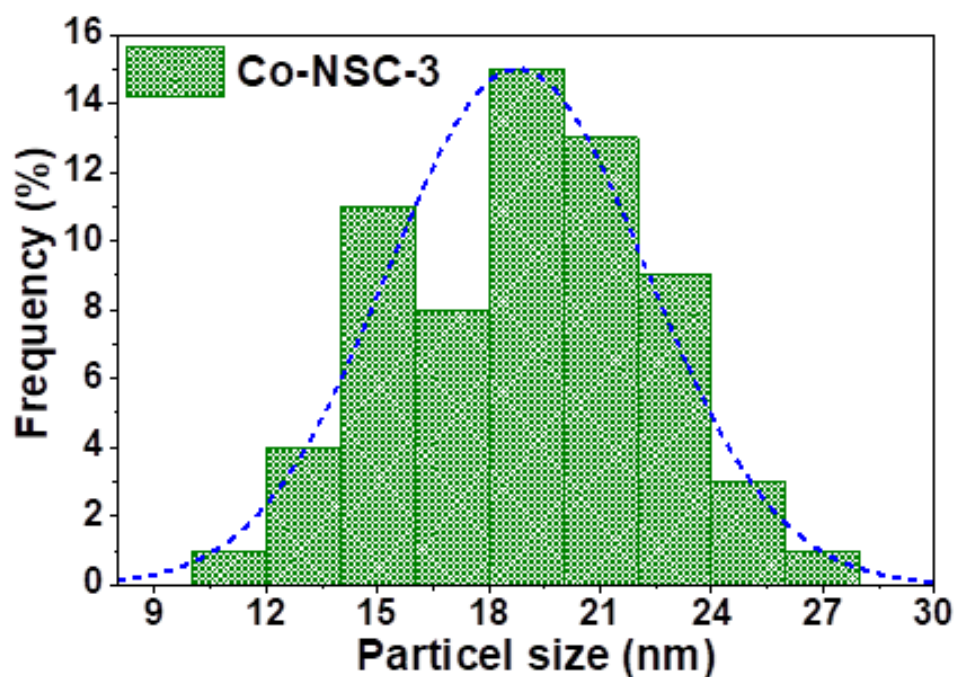


## Supplementary Materials

### Details of the commercial GDL used as backing layers for both anodes and cathodes:

- SIGRACET® GDL BC 35 as gas diffusion layers (GDL).
- The specifications are as follows
- Type: solid (paper)
- Thickness: 325  $\mu\text{m}$
- Basic weight: 110  $\text{g}/\text{m}^2$
- Air permeability: 1.5  $\text{cm}^3/(\text{cm}^2 \cdot \text{s})$
- Through plane resistance:  $<15 \text{ m}\Omega \text{ cm}^2$
- Teflon (PTFE %) content: 30



**Figure S1.** Particle size distribution of Co nanoparticle in Co-NSC-3 catalysts derived from the TEM images.



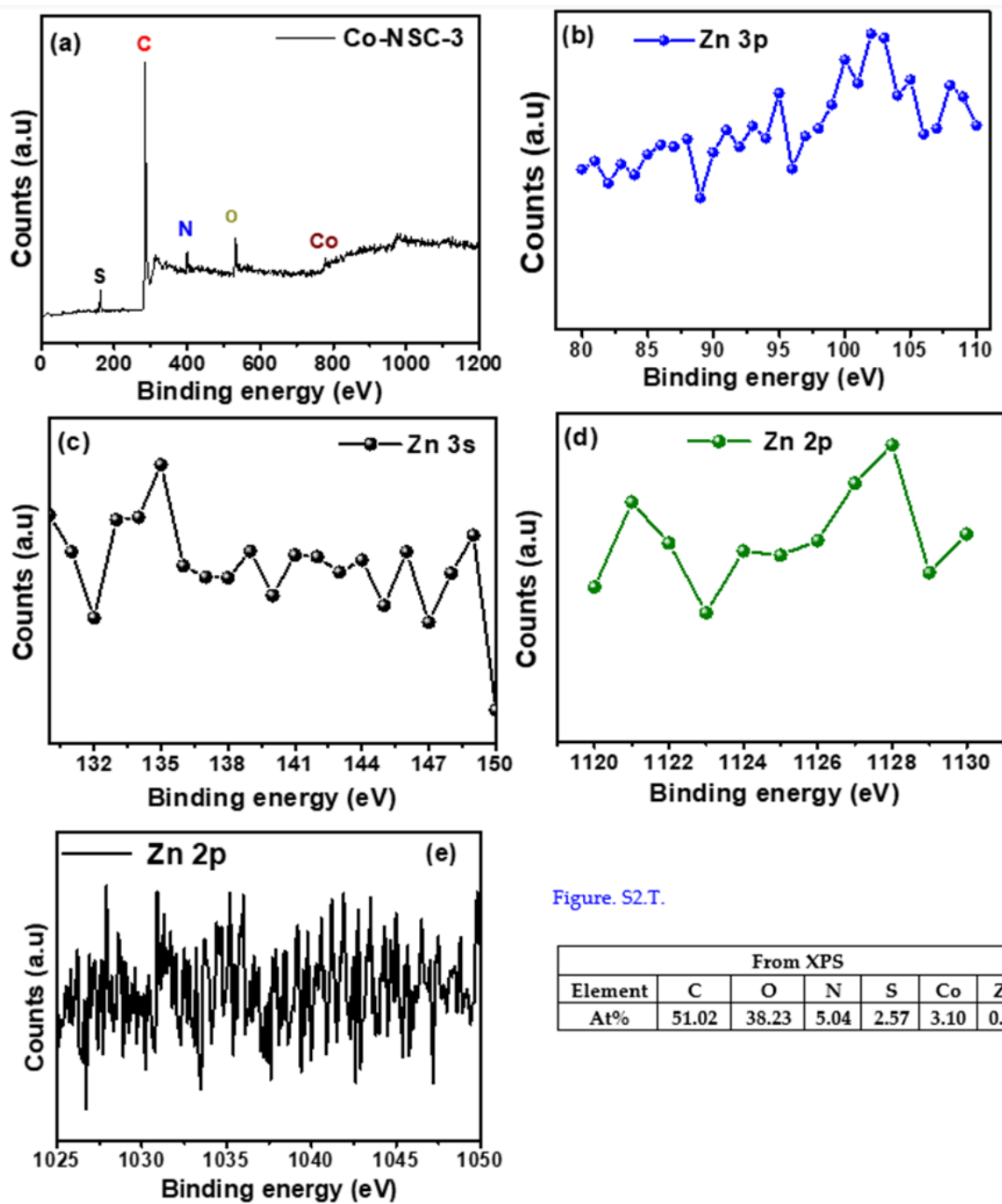
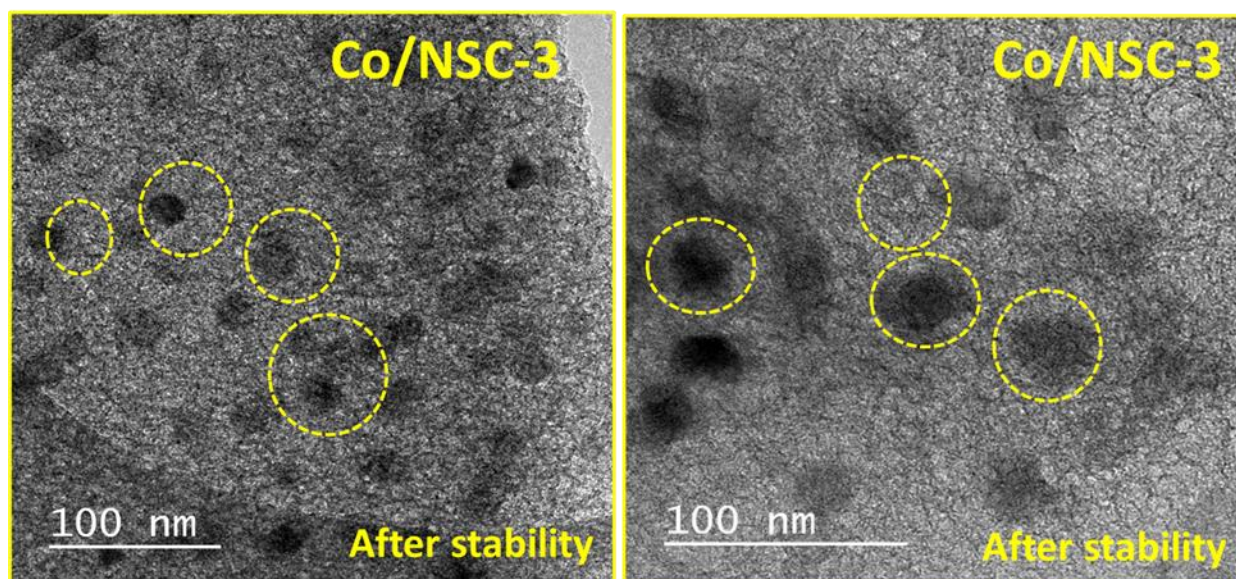


Figure. S2.T.

From XPS						
Element	C	O	N	S	Co	Zn
At%	51.02	38.23	5.04	2.57	3.10	0.04

Figure S2. (a) XPS survey spectrum for the Co-NSC-3 catalyst (b–d), survey scan of Zn 3p, 3s and 2p spectra, respectively. (e) Zn 2p high resolution scan. Figure. S2.T.





**Figure S3.** TEM images of Co/NSC-3 catalysts after stability test.