

Supporting Information

Boosting the Electrocatalytic Water Oxidation Performance of CoFe_2O_4 Nanoparticles by Surface Defect Engineering

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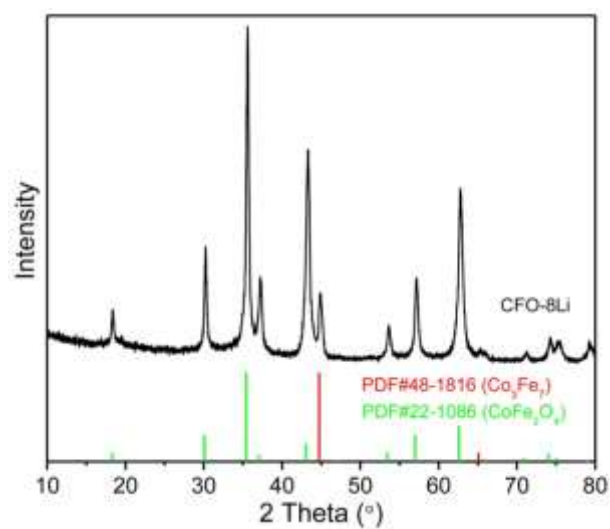


Figure S1. XRD plot of CFO-8Li nanoparticles.

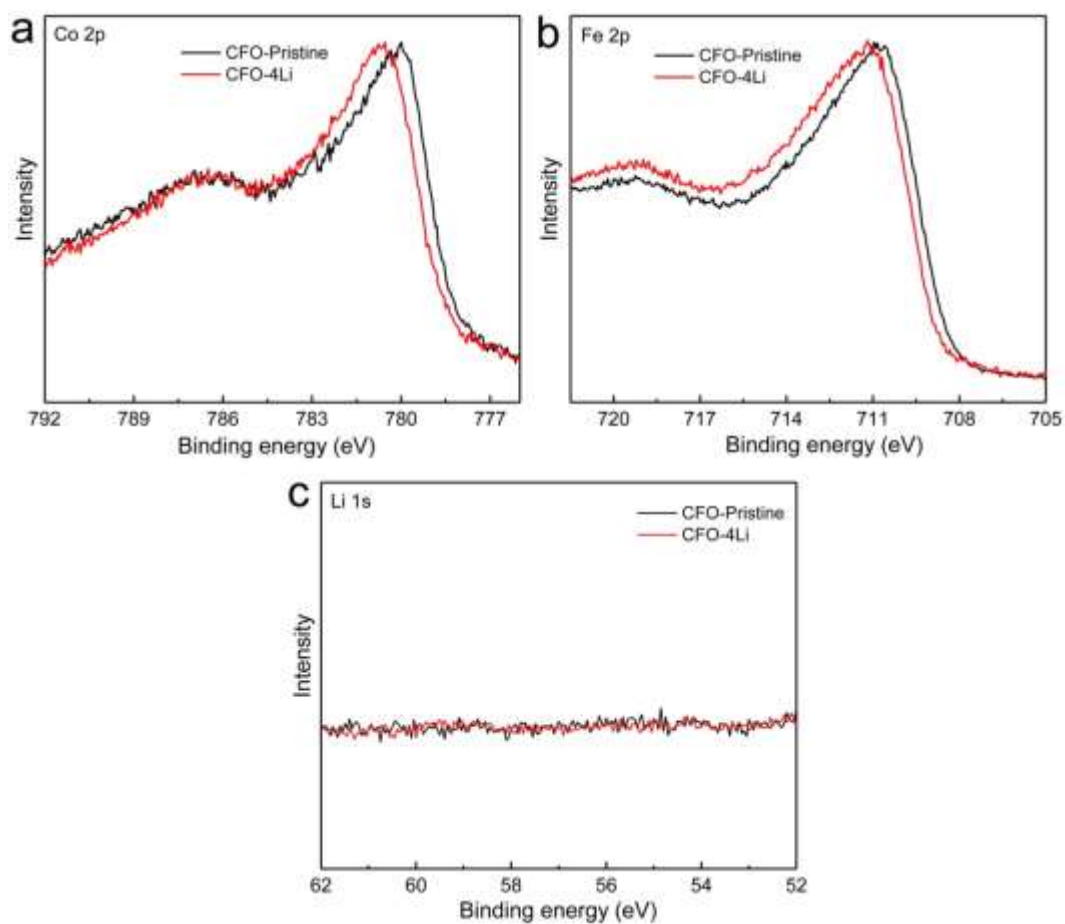


Figure S2. XPS spectra of pristine CFO and CFO-4Li nanoparticles. a, Co 2p. b, Fe 2p. c, Li 1s.

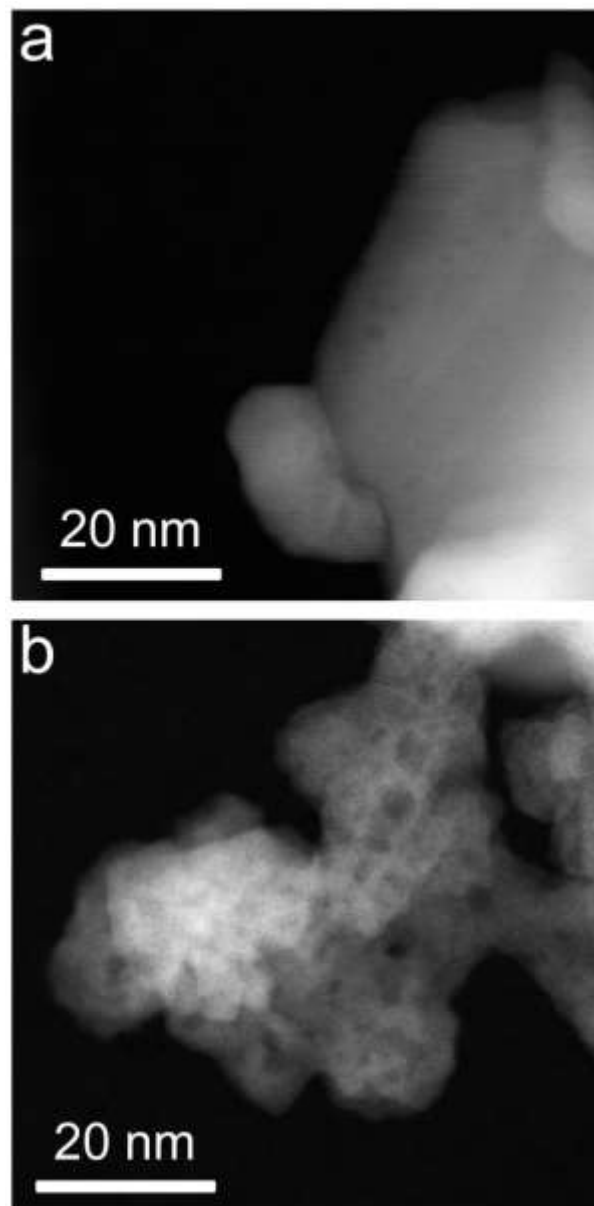


Figure S3. HAADF images of (a) pristine CFO and (b) CFO-4Li nanoparticles.

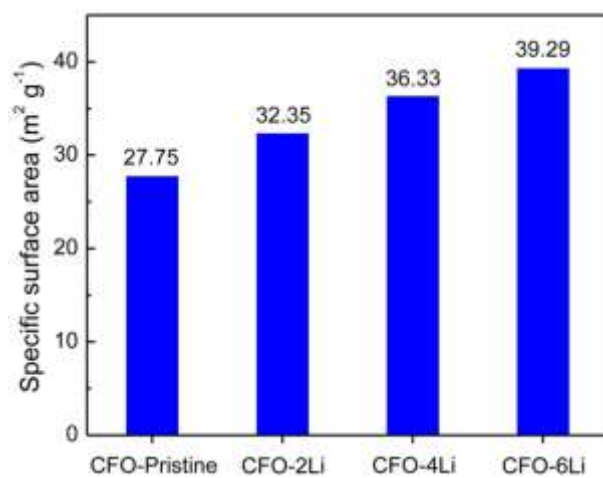


Figure S4. Specific surface areas of pristine and lithium reduced CFO nanoparticles.

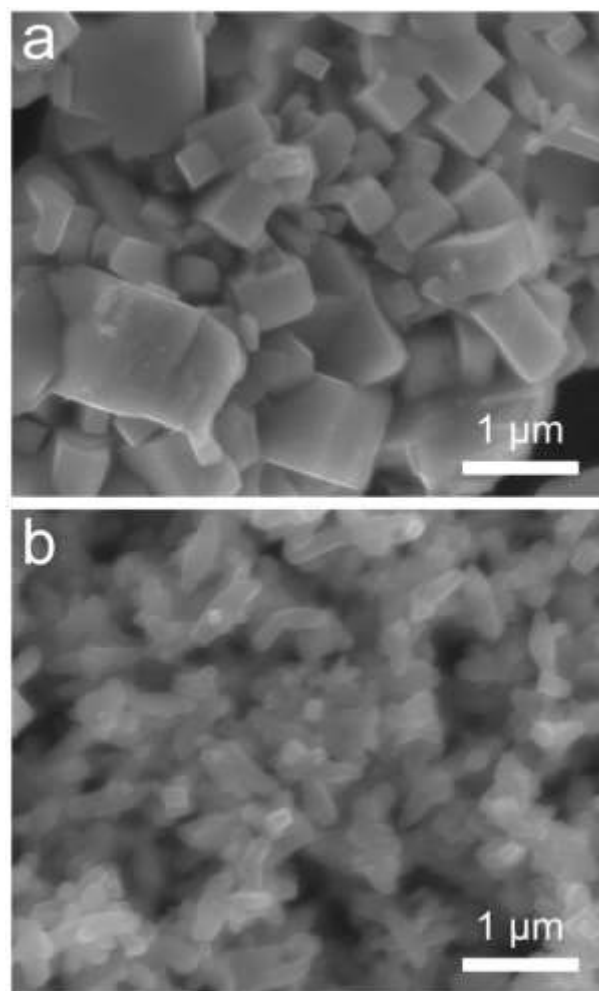


Figure S5. SEM images of commercial (a) IrO_2 and (b) RuO_2 powders.

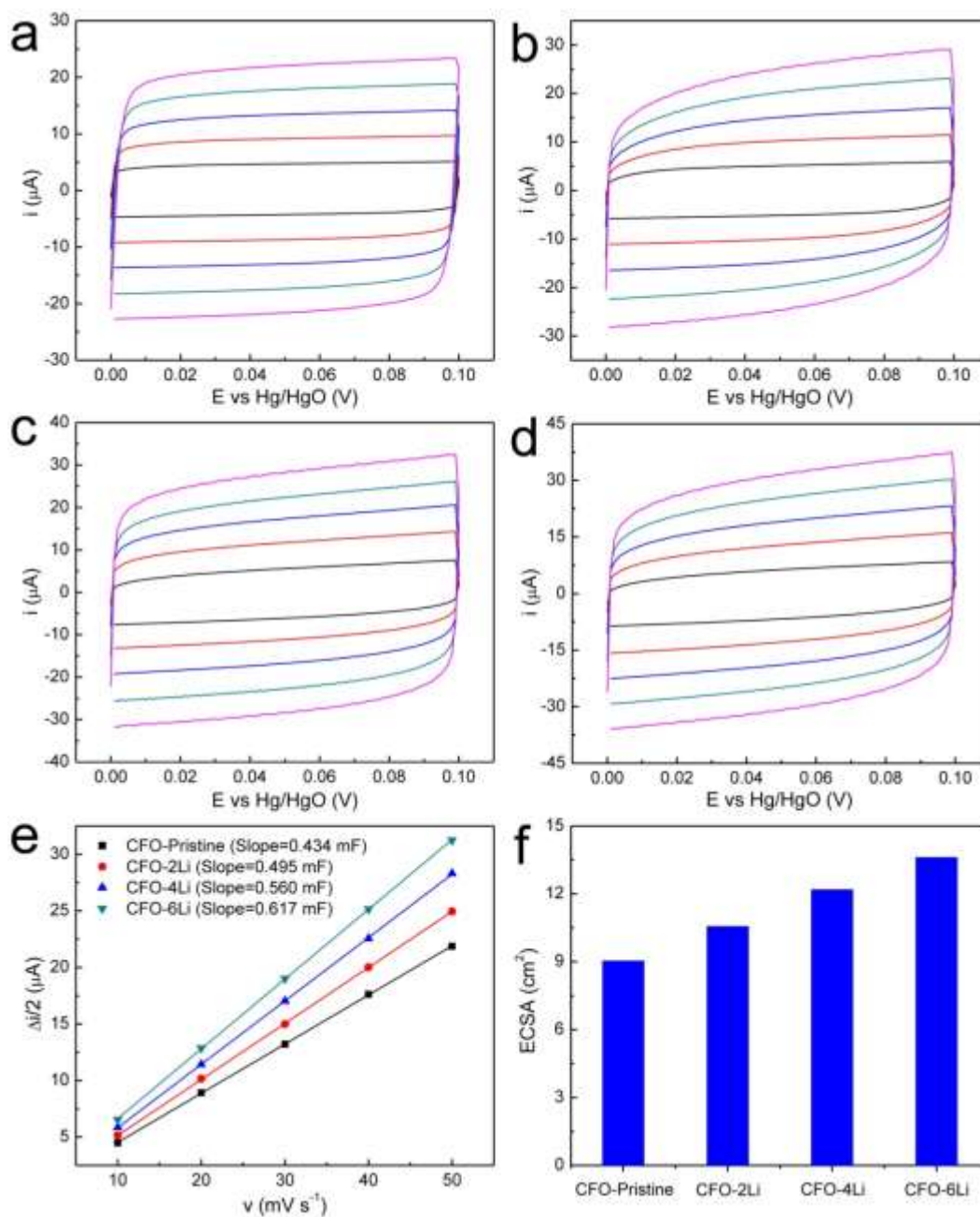


Figure S6. CV curves measured in the non-faradaic potential (0-0.1 V vs Hg/HgO) at different scan rates (10, 20, 30, 40 and 50 mV s^{-1}) for (a) CFO-Pristine, (b) CFO-2Li, (c) CFO-4Li and (d) CFO-6Li nanoparticles. (e) The half currents difference at 0.05 V vs Hg/HgO plotted as a function of scan rate. (f) The comparison of ECSA for CFO nanoparticles.

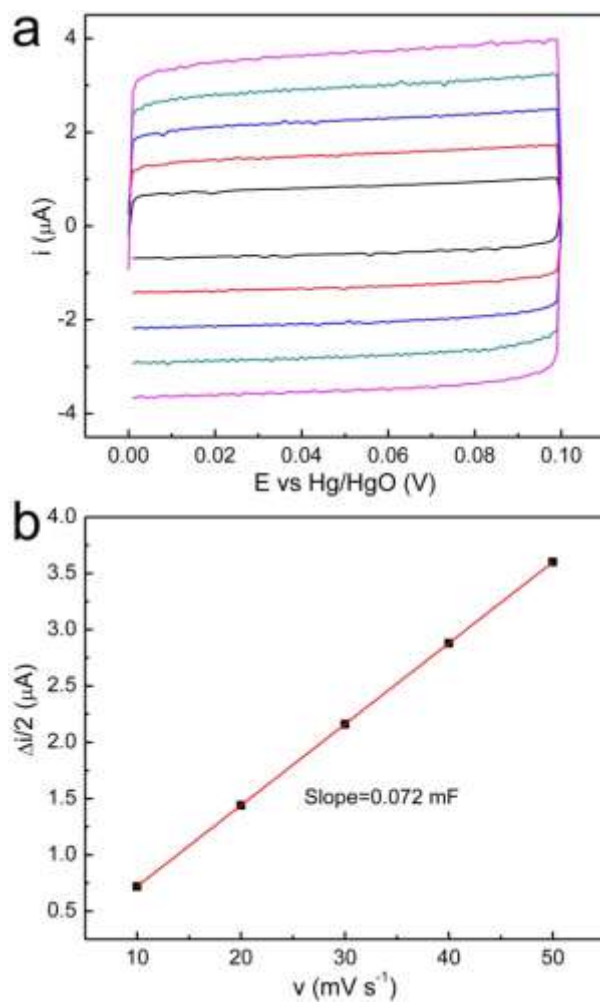


Figure S7. (a) CV curves measured in the non-faradaic potential (0-0.1 V vs Hg/HgO) at different scan rates (10, 20, 30, 40 and 50 mV s^{-1}) for CFP substrate. (b) The half currents difference at 0.05 V vs Hg/HgO plotted as a function of scan rate.

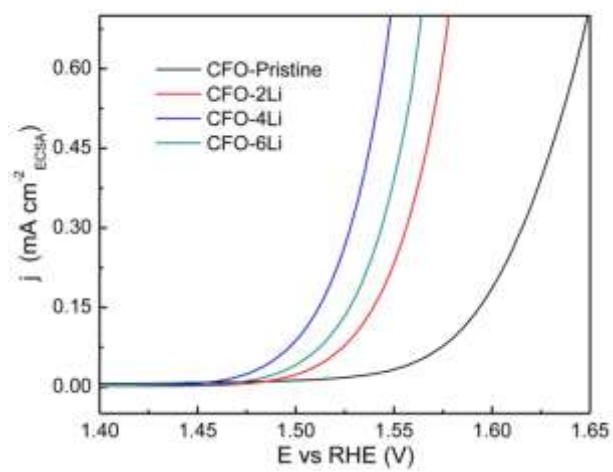


Figure S8. OER activity of pristine and lithium reduced CFO nanoparticles by ECSA.

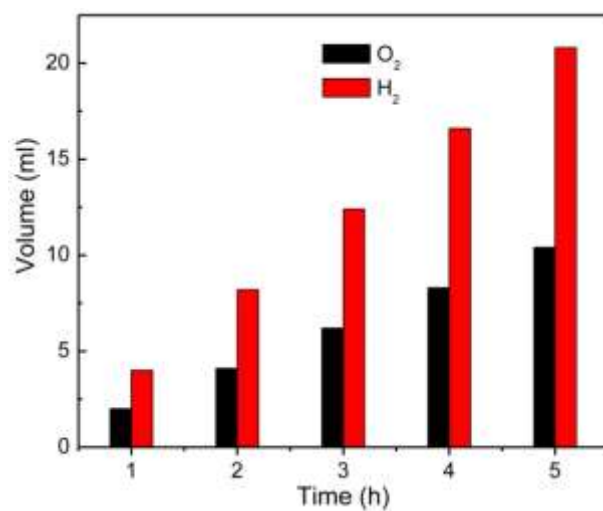


Figure S9. Volume of the generated H_2 and O_2 by CFO-4Li.

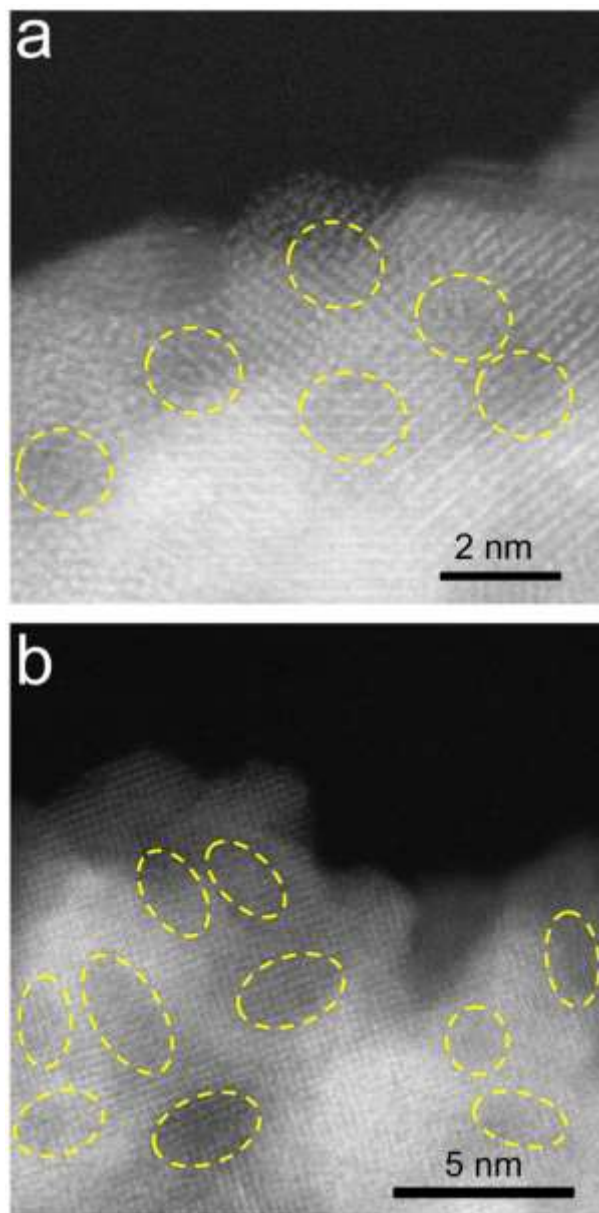


Figure S10. (a) High magnification and (b) low magnification HAADF images of CFO-4Li nanoparticles after 5 hours' OER test.

Table S1. ICP-MS results of pristine and lithium reduced CFO nanopowders.

Materials	Co (wt%)	Fe (wt%)	Li (wt%)	Fe (mol)/Co (mol)
CFO	27.01	49.05	0.005	1.91
CFO-2Li	26.21	47.27	0.028	1.90
CFO-4Li	25.92	47.71	0.054	1.94
CFO-6Li	25.39	45.27	0.065	1.88

Table S2. Comparison of OER activity for spinel oxide materials.

Catalyst	Electrolyte	Loading (mg cm ⁻²)	Current density (mA cm ⁻²)	Current density (A g ⁻¹)	Potential (vs RHE)	Ref.
CFO-4Li	1M KOH	0.2	46.5	232.5	1.55 V	This work
LCO	1M KOH	0.25	2.5	10	1.55 V	1
CVFO	1M KOH	0.2	22	110	1.55 V	2
NCO	0.1M KOH	0.12	4	33.3	1.55 V	3
ZFCO	1M KOH	0.255	3	11.8	1.55 V	4
MCO	0.1M KOH	0.2	1	5	1.55 V	5
CGO	1M NaOH	0.5	2.5	5	1.55 V	6
CFO	0.1M KOH	0.82	35	42.7	1.55 V	7
NCO	1M NaOH	1	40	40	1.55 V	8
Mn ₃ O ₄	1M KOH	0.285	24	84.2	1.55 V	9
NCO	0.1M KOH	0.2	3.5	17.5	1.55 V	10
CFO	0.1M KOH	0.4	2	5	1.55 V	11
CFO	1M NaOH	1	5	5	1.55 V	12
NCO	1M KOH	0.285	9	31.6	1.55 V	13
NCO@NLG	1M KOH	0.4	12	30	1.55 V	14
CFO@N-CNF	0.1M KOH	0.57	5	8.8	1.55 V	15
CCO@C	0.1M KOH	0.28	7.5	26.8	1.55 V	16
CFO@C	1M KOH	0.28	12	42.9	1.55 V	17
NCO@G	0.1M KOH	0.2	10	50	1.55 V	18
Co ₃ O ₄ @C	1M KOH	1.7	25	14.7	1.55 V	19
MCO@NC	0.1M KOH	0.2	32	160	1.55 V	20
NMCO@rGO	0.1M KOH	0.2	10	50	1.55 V	21
CFO@CNT	0.1M KOH	1	4	4	1.55 V	22
Co ₃ O ₄ @GCN	1M KOH	0.05	19	380	1.55 V	23
CFO@C	0.1M KOH	0.5	9.5	19	1.55 V	24
Co ₃ O ₄ /CBDC	1M KOH	-	80	-	1.55 V	25
Fe-Ni@NC-CNTs	1M KOH	0.5	65	130	1.55 V	26

NCO@Ni-Mn LDH	1M KOH	2	70	35	1.55 V	27
NF@NC-CFO/C	1M KOH	1	300	300	1.55 V	28
CMO@NCNT	1M KOH	0.21	5	23.8	1.55 V	29
NCO-HNSs@FTO	1M NaOH	-	6	-	1.55 V	30

Table S3. Resistance of CFO nanopowders before and after lithium reduction treatment.

Resistance (Ω)	CFO	CFO-2Li	CFO-4Li	CFO-6Li
R_s	9.1	6.2	6.9	5.4
R_{np}	227.5	41.5	14.5	27.6

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