Support Information

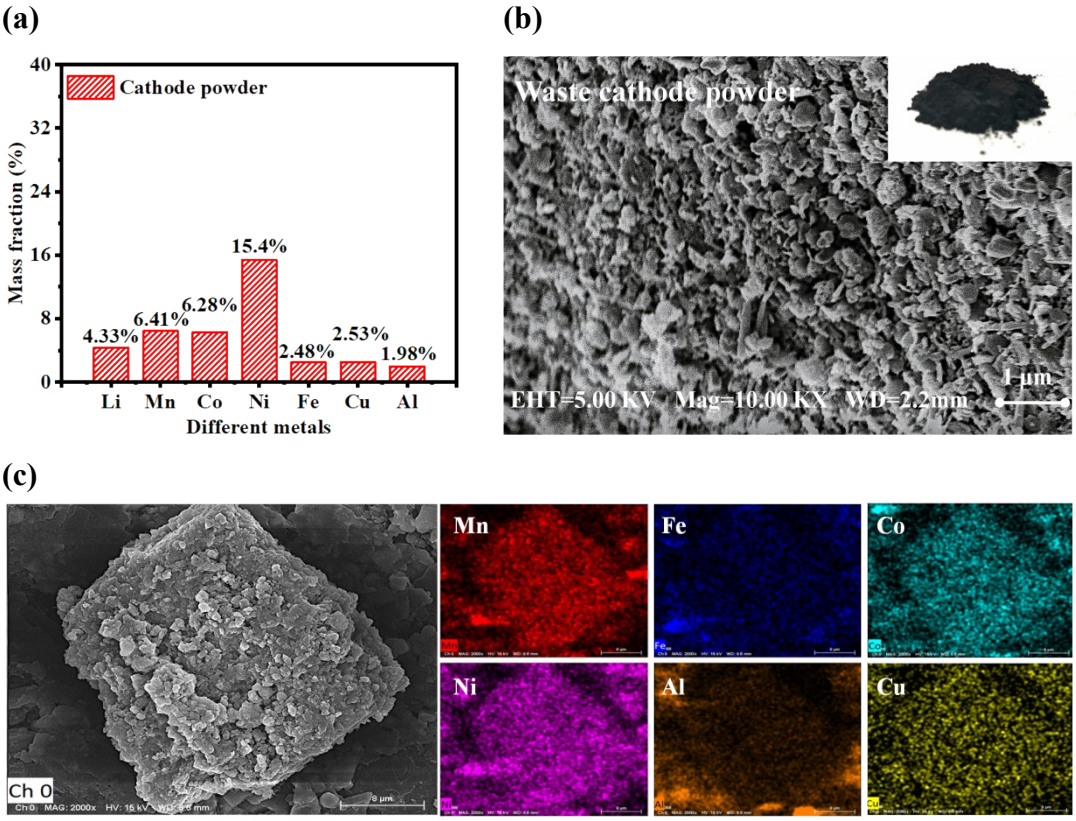


Fig. S1 (a) The mass fraction of the main metals in the original positive electrode powder. (b) SEM morphology and (c) elemental mapping diagram of the original positive electrode powder.

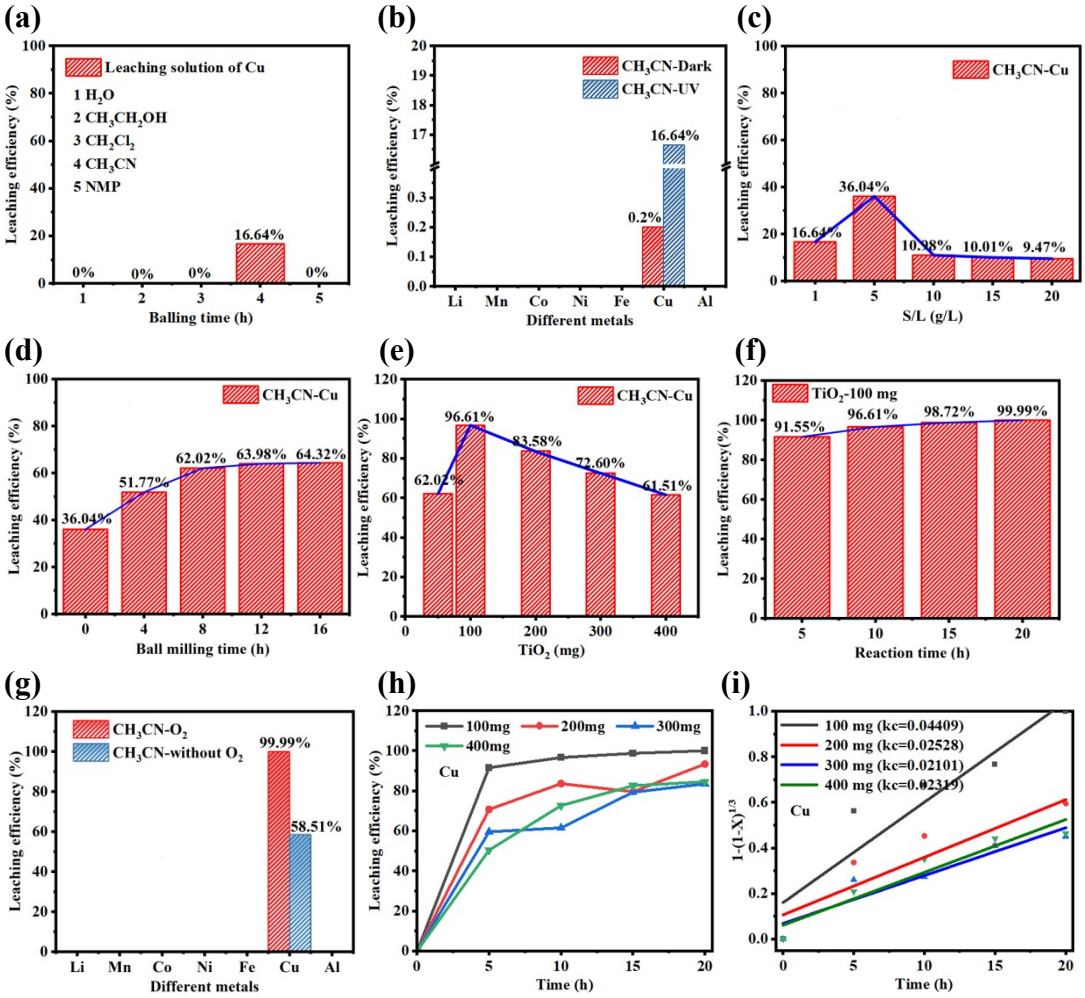
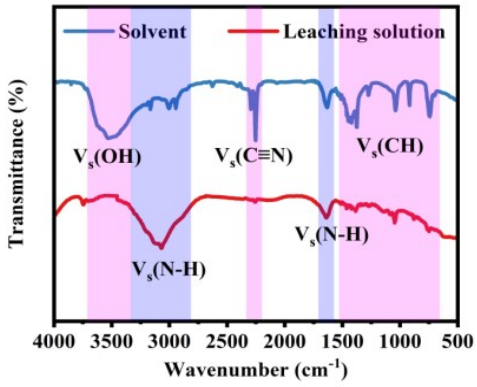
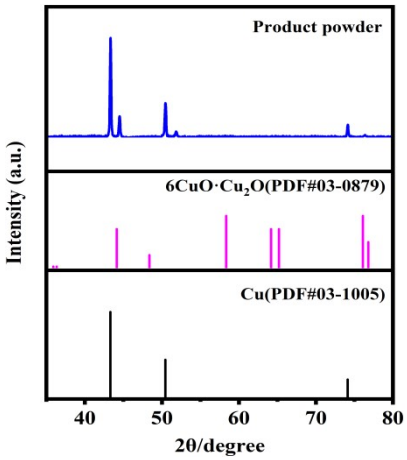


Fig. S2 (a) The leaching effect of different solvents on Cu under photocatalytic action. (b) Comparison of leaching efficiency of Cu under light-avoidance and light-illumination conditions. The leaching effect of different solvents on Cu under photocatalytic action. The effects of (c) the solid-liquid ratio, (d) the ball milling time, (e) the addition amount of TiO_2, (f) reaction time, and (g) oxygen on the leaching efficiency of Cu. Kinetic profile (h, i) of the leaching process of Cu under the control model of chemical reaction.

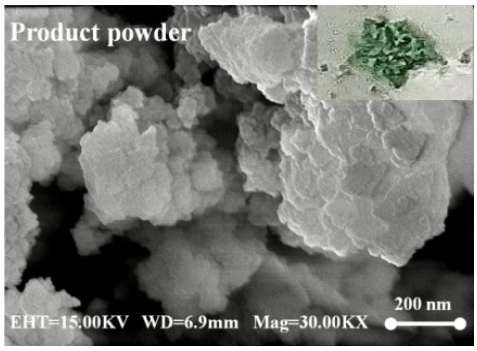
(a)



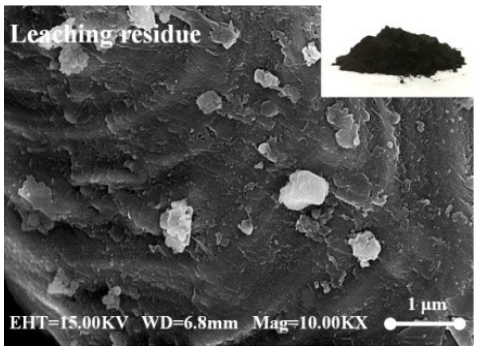
(b)



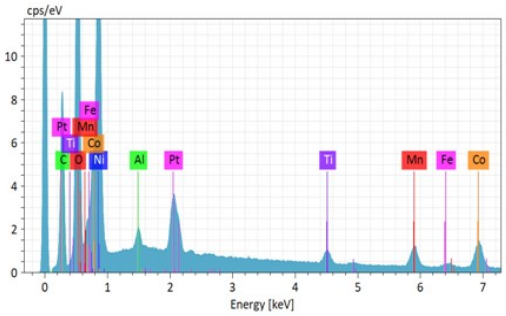
(c)



(d)

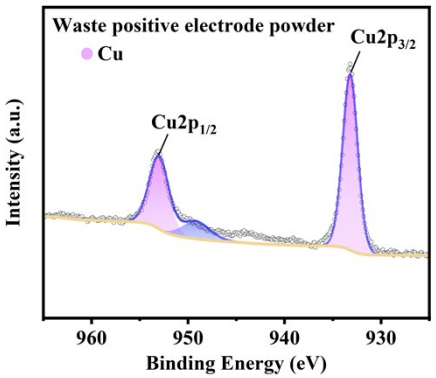


(e)

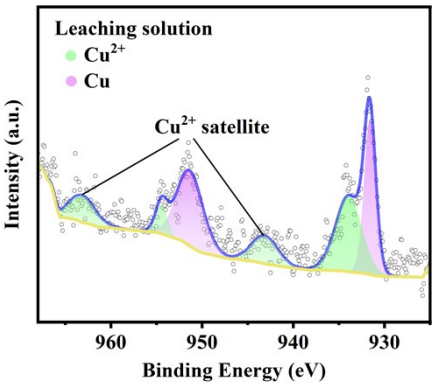


元素	原子数	净值	质量 [%]	归一化质量 [%]	原子 [%]	abs. error [%] (1 sigma)	abs. error [%] (3 sigma)	rel. error [%] (3 sigma)
O	8	103407	29.77	27.22	41.37	3.37	10.12	33.98
C	6	35356	19.84	18.14	36.73	2.43	7.29	36.76
Ni	28	69309	42.97	39.29	16.28	1.35	4.04	9.40
Co	27	15050	7.35	6.72	2.77	0.26	0.77	10.40
Mn	25	10489	2.85	2.61	1.15	0.11	0.34	11.95
Ti	22	6506	1.30	1.18	0.60	0.07	0.20	15.48
Pt	78	28221	4.39	4.01	0.50	0.20	0.59	13.40
Al	13	6146	0.57	0.52	0.47	0.05	0.16	28.24
Fe	26	1015	0.33	0.30	0.13	0.04	0.12	36.49
		总计：	109.37	100.00	100.00			

(f)



(g)



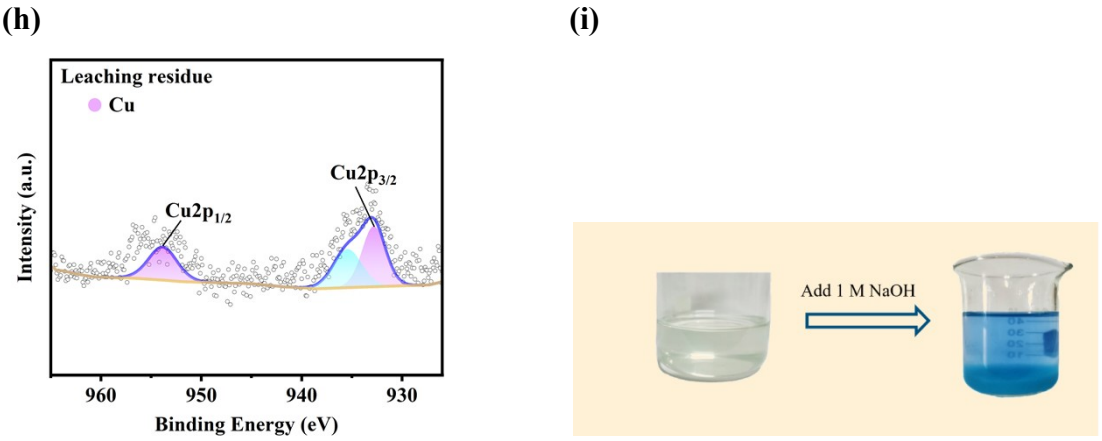


Fig. S3 (a) FTIR spectra of CH_3CN solvent and Cu leaching solution. (b) XRD of powder abtained by vacuum dring Cu leaching solution. SEM morphology of (c) Cu leaching solution and (d) filter residue after Cu removal after vacuum drying. (e) EDS diagram of filter residue after Cu removal. XPS spectra of Cu in (f) waste positive electrode powder, (g) product powder after drying of the leaching solution, and (h) leaching residue. (i) Physical diagram of the change in colour of the solution after the addition of NaOH.

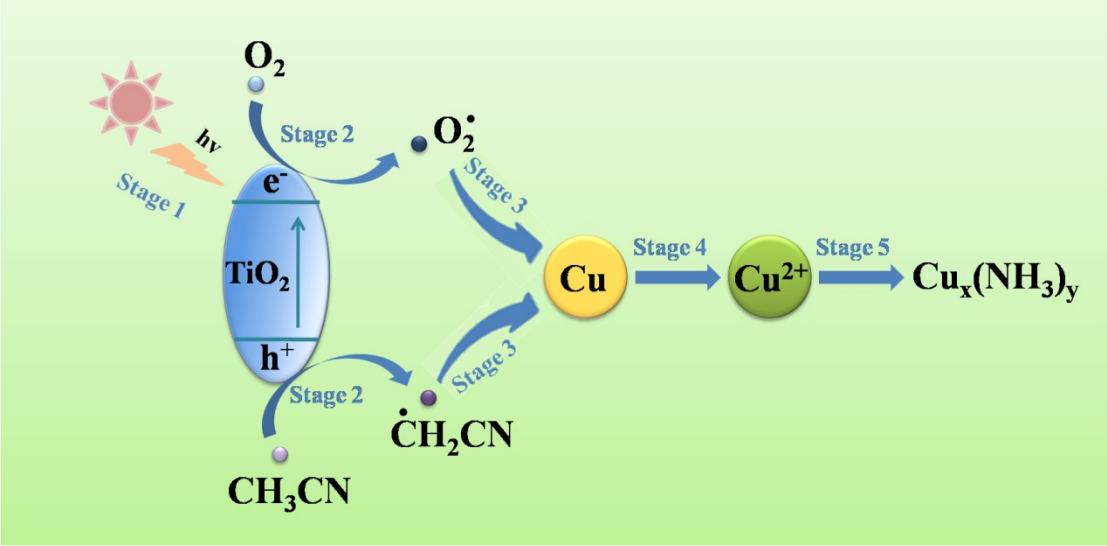


Fig. S4 Schematic diagram of Cu leaching reaction mechanism.

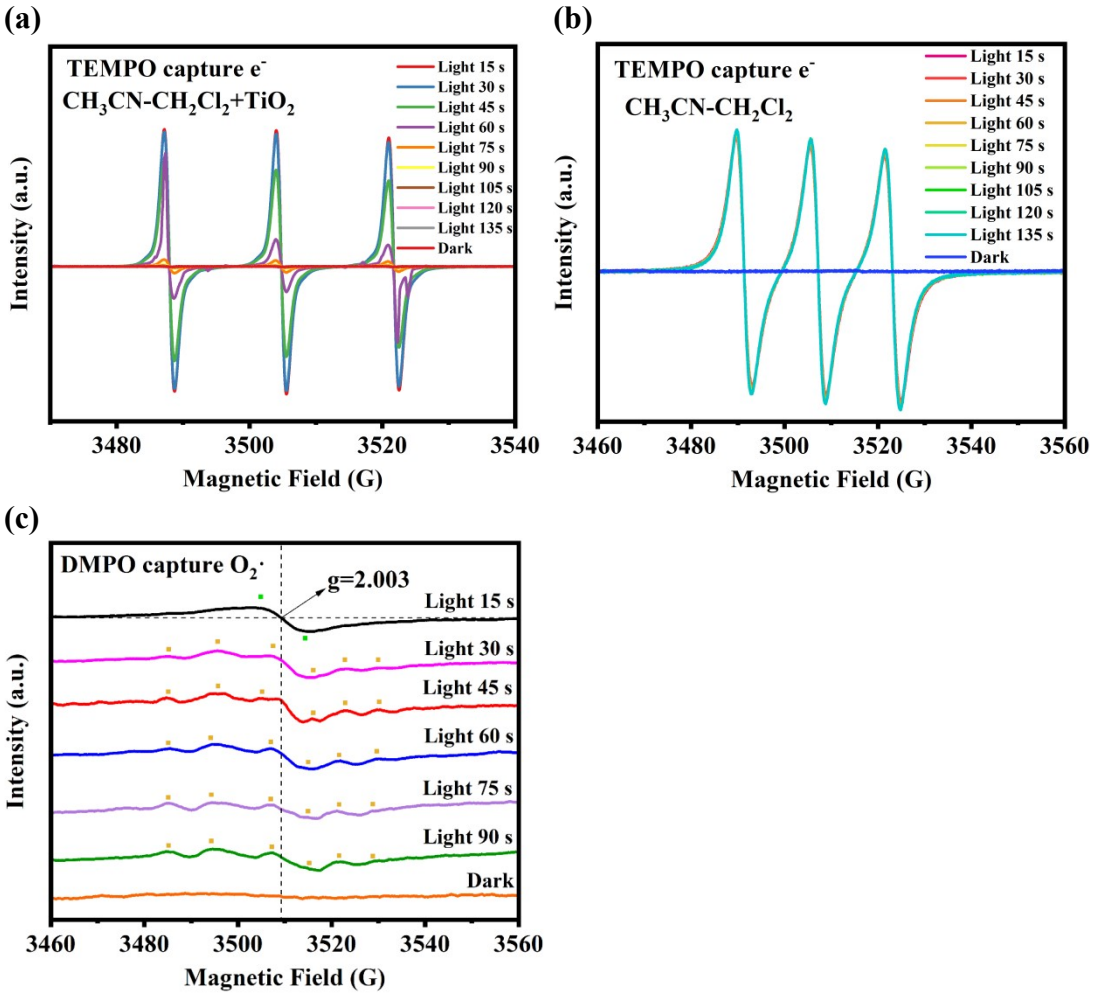


Fig. S5 EPR signal spectra of mixed systems (a) with and (b) without TiO_2. (c) EPR signal spectrum of superoxide groups in mixed systems.

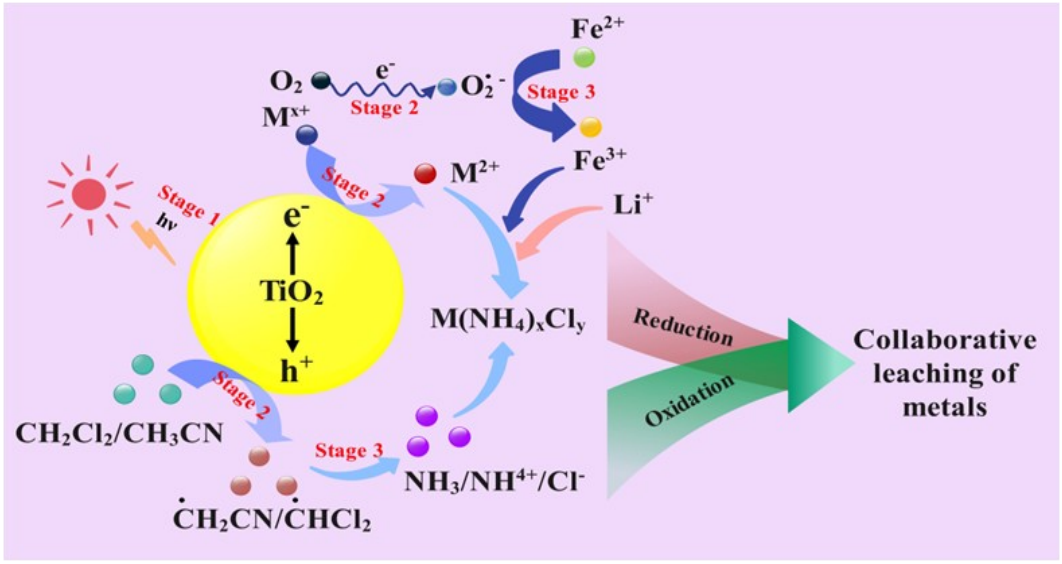


Fig. S6 Schematic diagram of Li, Mn, and Co leaching reaction mechanism.

$$TiO_2 \xrightarrow{h\nu} e^- + h^+ \quad (3)$$

$$e^- + O_2 \longrightarrow \cdot O_2^- \quad (4)$$

$$h^+ + CH_3CN \longrightarrow \cdot CH_2CN + H^+ \quad (5)$$

$$h^+ + CH_2Cl_2 \longrightarrow \cdot CHCl + H^+ \quad (6)$$

$$M^{x+} + e^- \longrightarrow M^{2+} \quad (7)$$

Fig. S7 Main chemical reaction equation.