

Figure S1 Adsorption experiment of of PTA biochemical tail water by artificial zeolite

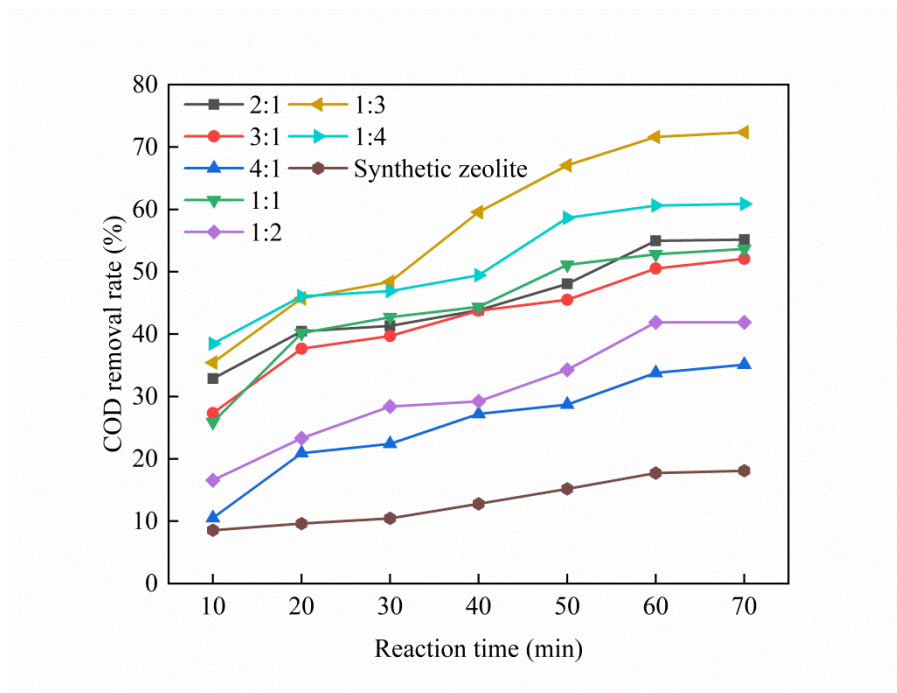


Figure S2 The effect of element impregnation ratio on the oxidation efficiency of PTA biochemical tail water (roasting temperature 300 °C, roasting time 3 h, pH = 8.5, reaction time 70 min, catalyst dosage 75 g /L, ozone generation 1.5 g / h, aeration 0.05 L / min)

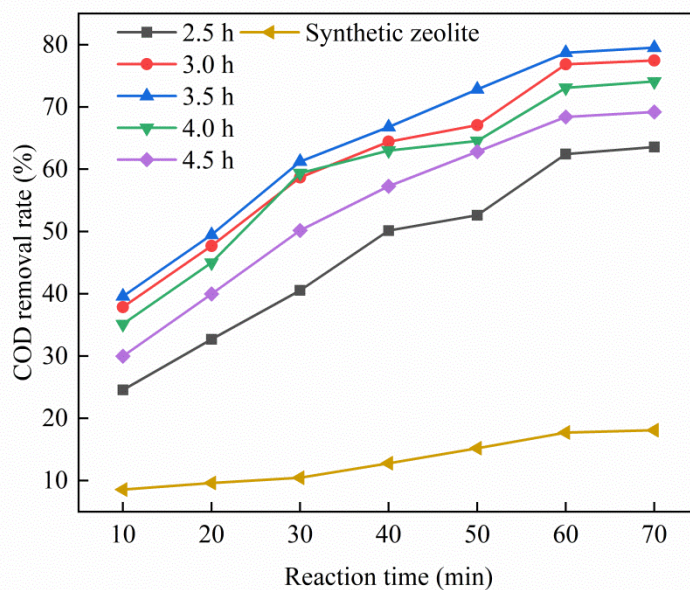


Figure S3 The effect of roasting temperature on the oxidation efficiency of PTA biochemical tail water (impregnation ratio of Cu: Ce = 1:3, calcination time 3.0 h, pH = 8.5, reaction time 70 min, catalyst dosage 75 g /L, ozone generation 1.5 g / h, aeration 0.05 L / min)

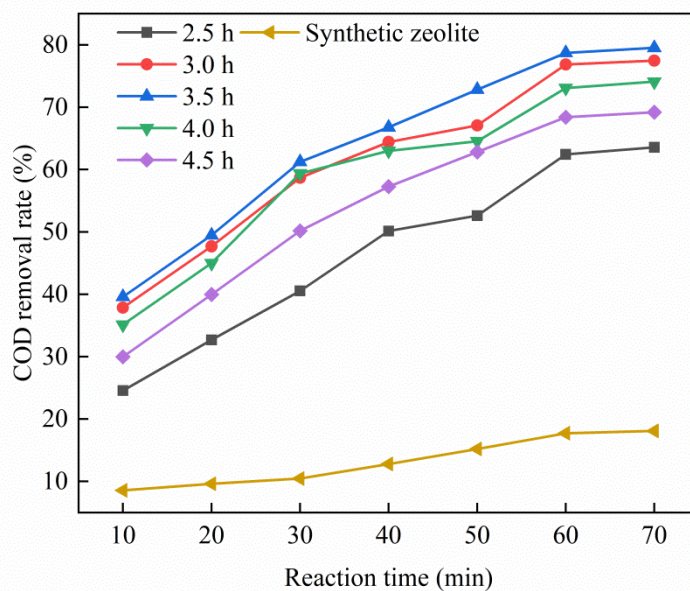


Figure S4 The effect of roasting time on the oxidation efficiency of PTA biochemical tail water (impregnation ratio of Cu: Ce = 1:3, calcination temperature 400 °C, pH = 8.5, reaction time 70 min, catalyst dosage 75 g /L, ozone generation 1.5 g / h, aeration 0.05 L / min)

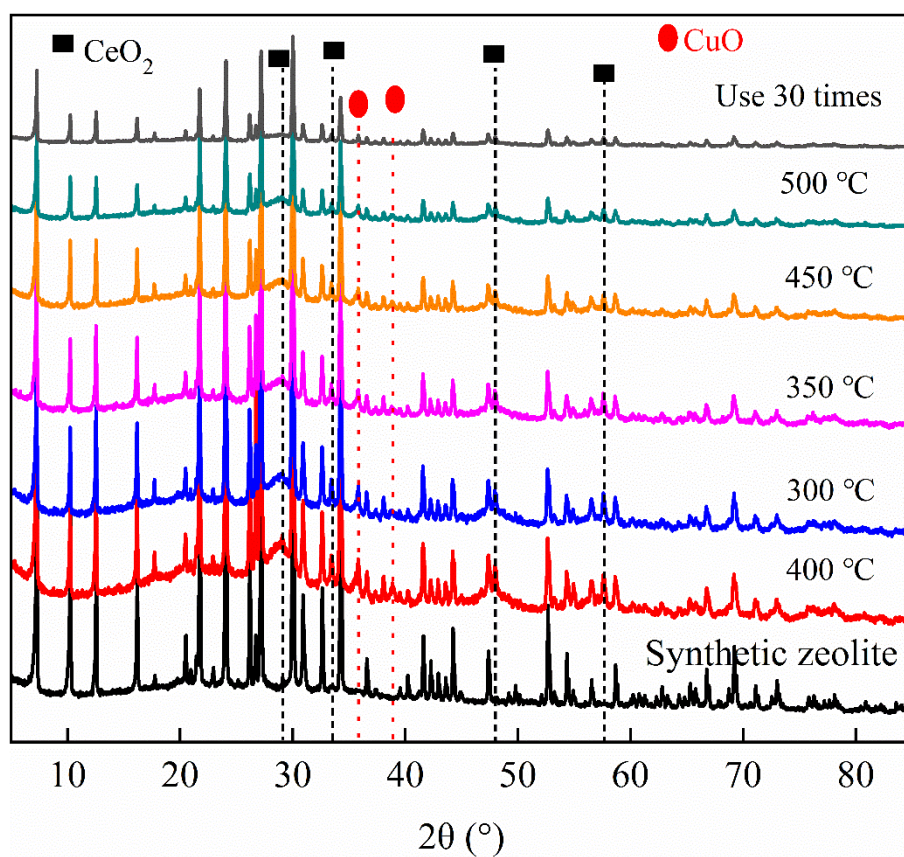
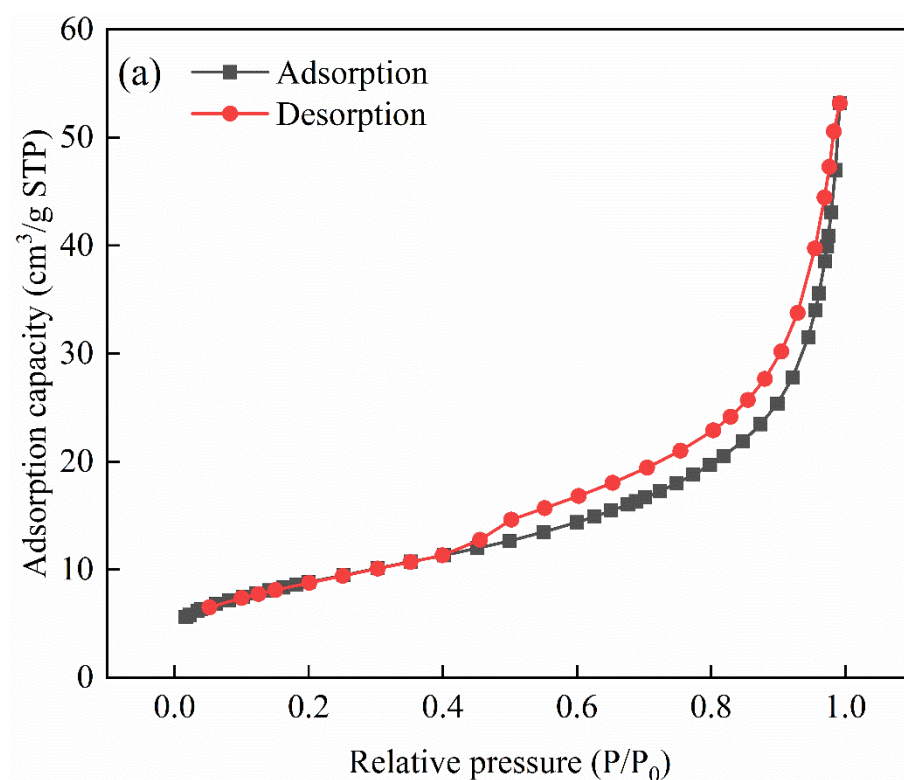


Figure S5 XRD characterization of Cu-Ce@Az catalysts



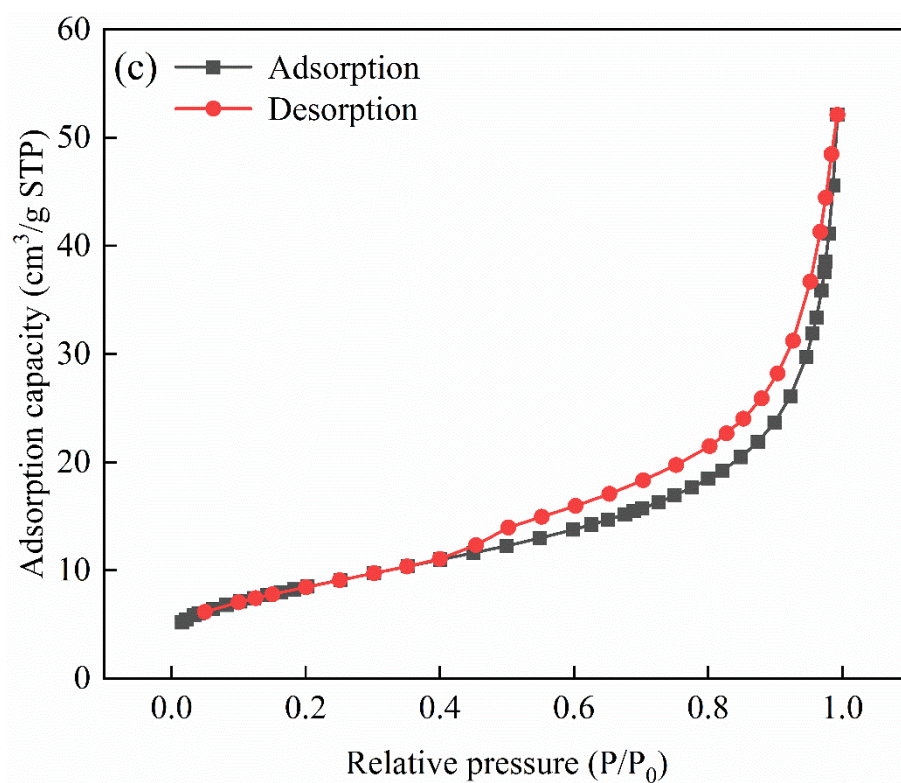
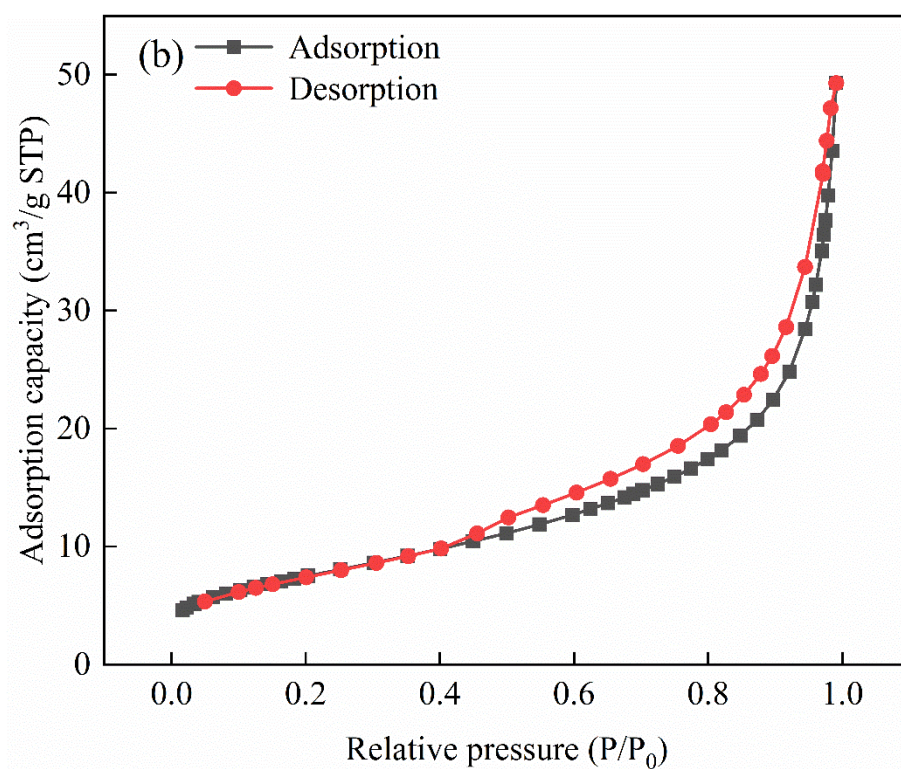


Figure S6 Adsorption and desorption isotherms: (a) Synthetic zeolite, (b) Cu-Ce@Az catalyst, (c) Cu-Ce@Az after utilization 30 times

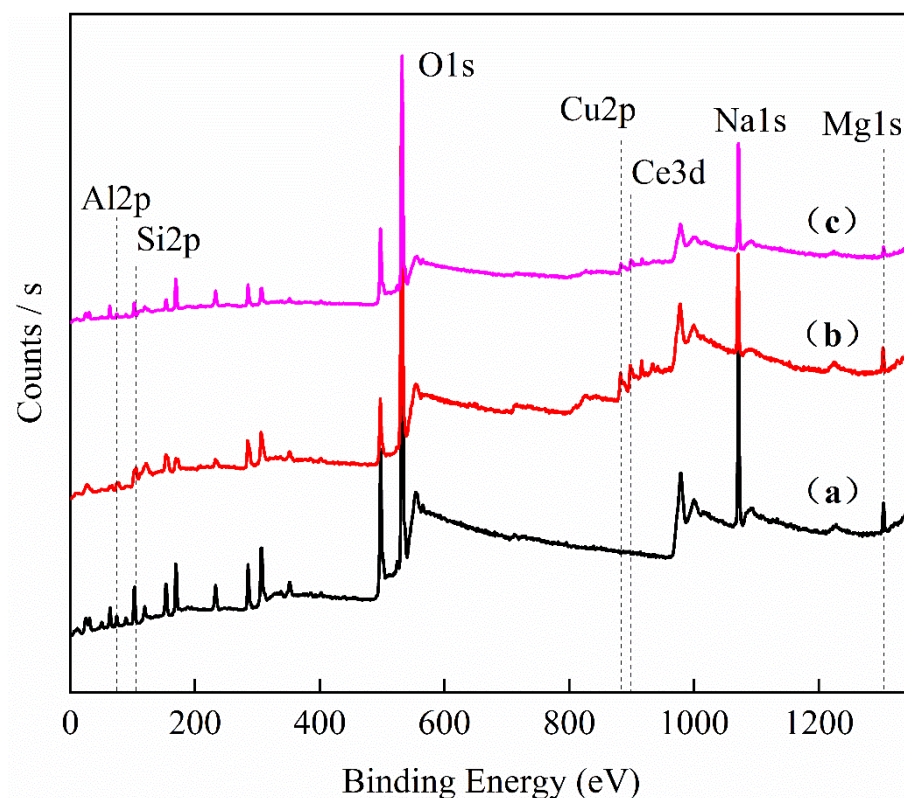


Figure S7 XPS characterization: (a) Synthetic zeolite, (b) Cu-Ce@Az catalyst, (c) Cu-Ce@Az after utilization 30 times

Table S1 BET characterization analysis of Cu-Ce@Az catalyst

Sample	Specific surface area	Average pore volume	Average pore size
	(m ² /g)	(cm ³ /g)	(nm)
Synthetic zeolite	26.85	7.14×10 ⁻³	11.21
Cu-Ce@Az	31.66	8.63×10 ⁻³	11.03
Cu-Ce@Az after utilization 30 times	30.33	8.01×10 ⁻³	10.94

Table S2 XRF characterization of Cu-Ce@Az catalyst

Oxide	Na ₂ O	MgO	Al ₂ O ₃	SiO ₂	CaO	Fe ₂ O ₃	CuO	CeO ₂
Synthetic zeolite (%)	15.675	2.5766	32.9294	44.8477	2.1036	1.0587	/	/
Cu-Ce@Az (%)	12.6099	2.2925	30.9237	41.6849	2.0324	1.1404	1.8941	6.6818
Cu-Ce@Az after utilization 30 times (%)	13.9759	2.24	31.1067	41.5445	2.0714	1.1592	1.7673	6.5275

Table S3 EDS characterization of Cu-Ce@Az catalyst

Sample	Synthetic zeolite		Cu-Ce@Az		Cu-Ce@Az after utilization 30 times	
Element	Weight percentage (%)	Atomic percentage (%)	Weight percentage (%)	Atomic percentage (%)	Weight percentage (%)	Atomic percentage (%)
O K	62.50	74.65	58.69	72.83	59.81	73.73
AlK	16.15	11.44	16.57	12.19	16.08	11.75
SiK	19.83	13.49	19.54	13.81	19.39	13.62
CeL	/	/	2.68	0.79	2.33	0.74
CuK	/	/	2.52	0.38	2.39	0.34