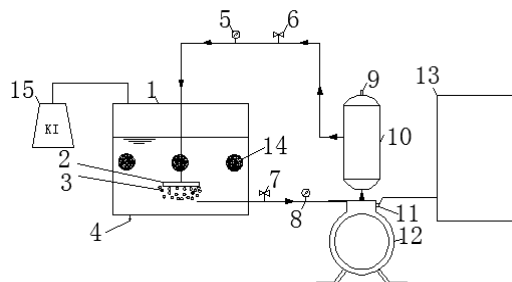




Supplementary Materials



1—oxidation reactor; 2—aerators; 3—micro-nano bubbles; 4—drain ; 5—pressure gauge; 6—water outlet valve; 7—water inlet valve; 8—vacuum gauge; 9—exhaust valve; 10—dissolved gas tank; 11—air inlet; 12—gas-liquid mixing pump; 13—O₃ generator; 14—heterogeneous catalysts; 15—exhaust gas absorber.

Fig. S1. Experimental setup of catalytic ozonation

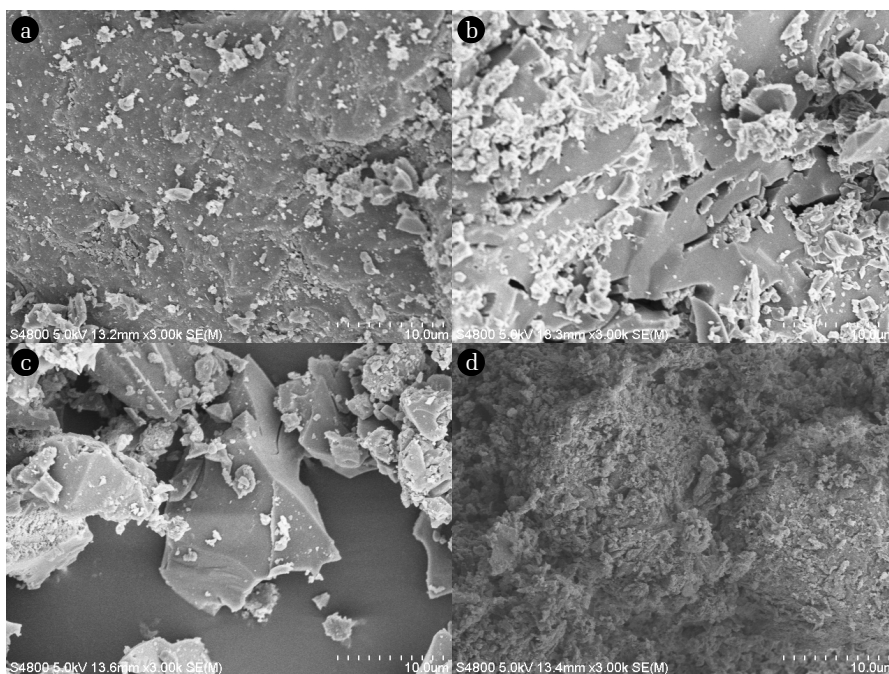


Fig. S2. SEM images of (a) unmodified activated carbon, (b) manganese nitrate modified activated carbon, (c) copper nitrate modified activated carbon, and (d) ferric nitrate modified activated carbon.

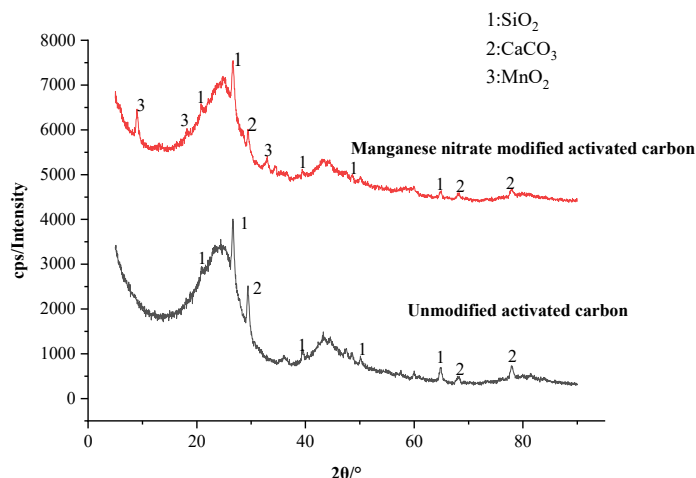


Fig. S3. XRD patterns of activated carbon before and after modification.

Table S1. Other experimental chemicals

Chemical	Purity	Supplier
Ammonia	AR	Shenyang Dongxing Reagent Factory
Potassium dichromate	AR	Tianjin Tianxin Fine Chemical R&D Center
Potassium aluminum sulfate	AR	Shenyang Shenglongfu Experimental Equipment Co., Ltd.
Ammonium molybdate	AR	Tianjin No. 3 Chemical Reagent Factory
silver sulfate	AR	Tianjin Aopuseng Chemical Co., Ltd.
Mercury sulfate	AR	Guizhou Tongren Chemical Reagent Factory
Potassium hydrogen phthalate	AR	Shenyang Shenglongfu Experimental Equipment Co., Ltd.
Potassium iodide	AR	Shenyang Dongxing Reagent Factory
Mercury iodide	AR	Shenyang Shenglongfu Experimental Equipment Co., Ltd.
Potassium sodium tartrate	AR	Tianjin Tianxin Fine Chemical R&D Center
Ammonium chloride	AR	Shenyang Shenglongfu Experimental Equipment Co., Ltd.
Sodium chloride	AR	Shenyang Shenglongfu Experimental Equipment Co., Ltd.
30% hydrogen peroxide	AR	Tianjin Tianxin Fine Chemical R&D Center
Potassium permanganate	AR	Shenyang Dongxing Reagent Factory

Table S2. BET of activated carbon before and after modification

Samples	Specific surface area/(m ² /g)	Pore volume/(cm ³ /g)	Average pore size/(nm)
Unmodified activated carbon	35.122	0.019	2.508
Manganese nitrate modified activated carbon	20.636	0.013	2.356
Copper nitrate modified activated carbon	20.465	0.012	2.310
Iron nitrate modified activated carbon	5.143	0.005	1.365