Rapid and efficient degradation of organic contaminants with microplasma electrochemistry method

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Fig. S1 Schematic of the microplasma discharge experimental setup in the non-separated (a) and separated (b) electrode systems. (c) Degradation of RhB in the non-separated system.

Fig. S2 pH changes of the RhB solution treated with microplasma anode in different systems.
To confirm the proposed mechanism, we proposed oxidizing KI experiments. Based on the reaction with KI, the concentration of AOPs formation was estimated by colorimetric method. The method consists in mixing 4 mL 0.1M KI and 100 μL 0.01M ammonium molybdate with the sample, which contains residual hydrogen peroxide, and allowing to react for 15 min. The absorbance was measured at k = 315 nm with a spectrophotometer and the result was listed below (Fig. S3). It was clear that more AOPs were obtained in air than the N₂ atmosphere. While, this experiment only confirmed the formation of AOPs and it is still unclear to verify the generation of H₂O₂ during the microplasma treatment.

![Graph](image_url)

**Fig. S3** The concentration of AOPs treated with microplasma anode under different atmosphere with KI method.

Because the lifetime of the reactive radicals is quite short and most of them are shorter than 1 min. Then the solutions placed for 10 minutes after treating with microplasma were measured with TiSO₄ method, which was mainly applied to detect the production of H₂O₂ or hydroxyl radicals. The results in Fig. S4a showed that after placed for 10 minutes, the concentration of the active species was enhanced other than disappeared. It also indicated the long lifetime of the active species, which might be recognized as H₂O₂. Besides, the RhB solution was treated with microplasma anode for 2 min and then turn off the microplasma. It was clear that the RhB was continuous degraded by the active species during the next 8 min (Fig. S4b), which also verified the generation of H₂O₂ during the treatment of microplasma. And the detailed description has been listed in the revised manuscript.
Fig. S4 (a) The concentration of H$_2$O$_2$ treated with microplasma anode with TiSO$_4$ method. (b) The degradation of RhB treated with microplasma for 2 min and then turn off the microplasma.

Fig. S5 Degradation of MB with microplasma anode.

Fig. S6 The concentration of H$_2$O$_2$ generated with Ar plasma changed with the treatment time.
**Fig. S7** Under N\(_2\) plasma, degradation diagram of RhB (a), concentration of H\(_2\)O\(_2\) as a function of treatment time (b) and fluorescence spectrum of NaTA (c) in different gas environments.

**Fig. S8** The degradation diagram of sunset yellow (a), tartrazine (b), allura red (c), neutral red (d), amaranth (e), new coccine (f), malachite green (g) under plasma treatment.