

## Degradation of high salinity organic wastewater by plasma Synergistic catalysis

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A large amount of high-salinity (salt concentration > 1%) and phenol-containing wastewater produced in the production and use of fine chemical industries such as pesticide manufacturing, drug synthesis, rubber and textile [1] is one of the main sources of water pollution. The phenolic pollutants contained in high-salt phenol-containing wastewater are persistent, toxic and harmful, and have low biodegradability. And the salt contained in the wastewater is characterized by complex composition and high concentration. If untreated, it will cause serious harm to the growth and health of organisms and destroy the ecological balance for a long time. Currently, the high-salt phenol-containing wastewater has been classified as dangerous wastewater [2].

Atmospheric pressure gas-liquid discharge plasma technology has been widely used in the field of organic wastewater treatment, which has the advantages of producing abundant reactive species, strong adaptability to the treatment object, simple operation, etc, and is considered to be a promising and environmentally friendly wastewater treatment technology [3]. Atmospheric pressure gas-liquid discharge plasma technology can be applied to the degradation of phenolic compounds in water, especially in the low conductivity liquid, the degradation efficiency of phenolic compounds can reach more than 90%.

However, under the condition of high-salt wastewater, the liquid has good electrical conductivity and can

effectively shield the electric field, so it is difficult to generate gas-liquid discharge on the liquid. As a result, there are few studies on the plasma characteristics and the degradation of phenolic compounds in high-salt wastewater, and the understanding of the plasma generation mechanism and the action mechanism of pollutants is still unclear.

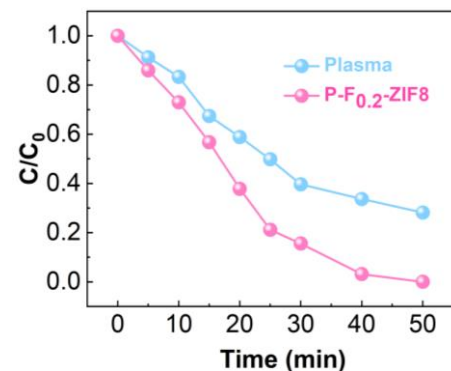
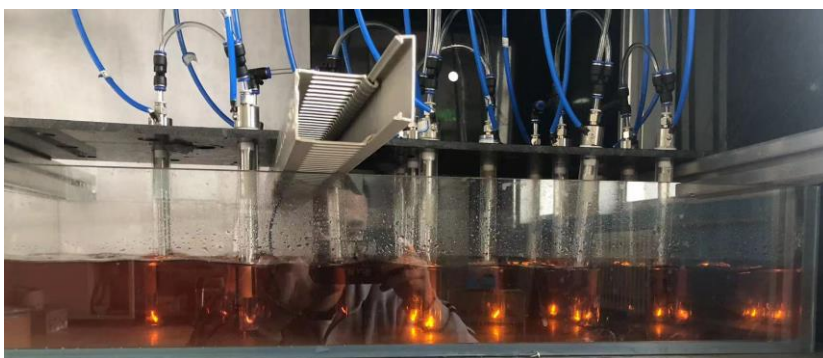
In our works, the stability and characteristics of gas-liquid discharge plasma under high conductivity solution are studied by changing discharge parameters, coupling matching circuit resistance and capacitance, and adjusting electrode structure. Gas-liquid discharge plasma assisted loading of iron ZIF catalyst technology are employed to treat high salt and phenolic wastewater. Currently, we have developed a stable large-area gas-liquid discharge plasma reactor under the condition of high salt waste, and successfully removed more than 90% of COD from high salinity phenolic wastewater (COD~10<sup>4</sup> mg/L) by plasma synergistic catalyst

References

[1] Liu D, *et al. CLEAN – Soil, Air, Water*, 49 2000410 (2021).

[2] Sun J, Mu Q, *et al. Adv. Compos. Hybrid Ma.*, 5 627-640 (2022).

[3] Terefinko D, *et al. Chem. Eng. J.*, 452, 139415(2023).



**Figure 1** Multi-needle gas-liquid discharge images and degradation of phenol by plasma synergistic catalyst