# Reactive species generated in the UV radiation of sulfite

| | | |
|---|---|---|
| $SO_3^{2-} \xrightarrow{hv} SO_3^{\cdot-} + e_{aq}^-$ | $k$ = 1.9×10$^{10}$ M$^{-1}$s$^{-1}$ | (S1) |
| $e_{aq}^- + O_2 \rightarrow O_2^{\cdot-}$ | $k$ = 1.9×10$^{10}$ M$^{-1}$s$^{-1}$ | (S2) |
| $O_2^{\cdot-} + H^+ \rightarrow HO_2$ | $pK$ = 4.8 | (S3) |
| $O_2^{\cdot-} + HO_2 \rightarrow HO_2^{\cdot-} + O_2$ | $k$ = 9.7×10$^{8}$ M$^{-1}$s$^{-1}$ | (S4) |
| $HO_2^{\cdot-} + H^+ \rightarrow H_2O_2$ | $pK$ = 11.6 | (S5) |
| $SO_3^{\cdot-} + O_2 \rightarrow SO_5^{\cdot-}$ | $k$ = 1.2×10$^{9}$ M$^{-1}$s$^{-1}$ | (S6) |
| $SO_5^{\cdot-} + SO_3^{2-} \rightarrow SO_3^{\cdot-} + SO_5^{2-}$ | $k \approx$ 1.3×10$^{7}$ M$^{-1}$s$^{-1}$ | (S7) |
| $SO_5^{\cdot-} + SO_3^{2-} \rightarrow SO_4^{\cdot-} + SO_4^{2-}$ | | (S8) |
| $SO_4^{\cdot-} + SO_3^{2-} \rightarrow SO_3^{\cdot-} + SO_4^{2-}$ | $k \approx$ 5×10$^{8}$ M$^{-1}$s$^{-1}$ | (S9) |
| $SO_5^{\cdot-} + O_2^{\cdot-} \rightarrow SO_5^{2-} + O_2$ | | (S10) |
| $SO_5^{\cdot-} + SO_5^{\cdot-} \rightarrow 2SO_4^{\cdot-} + O_2$ | $k \approx$ 6×10$^{8}$ M$^{-1}$s$^{-1}$ | (S11) |
| $SO_5^{\cdot-} + SO_5^{\cdot-} \rightarrow S_2O_8^{2-} + O_2$ | $k \approx$ 1.4×10$^{8}$ M$^{-1}$s$^{-1}$ | (S12) |

## Algal cell culture medium composition

**Table S1 Ingredients of BG-11 medium.**

| Reagent | Concentration (mg/L) | Reagent | Concentration (mg/L) |
|---|---|---|---|
| $NaNO_3$ | 1500 | $MnCl_2 \cdot 4H_2O$ | 1.86 |
| $K_2HPO_4$ | 40 | $Na_2MoO_4 \cdot 2H_2O$ | 0.22 |
| $MgSO_4 \cdot 7H_2O$ | 75 | $CuSO_4 \cdot 5H_2O$ | 0.08 |
| $CaCl_2 \cdot 2H_2O$ | 36 | $Co(NO_3)_2 \cdot 6H_2O$ | 0.05 |
| $C_6H_8O_7$ | 6 | $Na_2CO_3$ | 20 |
| $C_6H_8FeNO_7$ | 6 | $H_3BO_3$ | 2.86 |
| $EDTANa_2$ | 1 | | |

## Characteristics of feed water

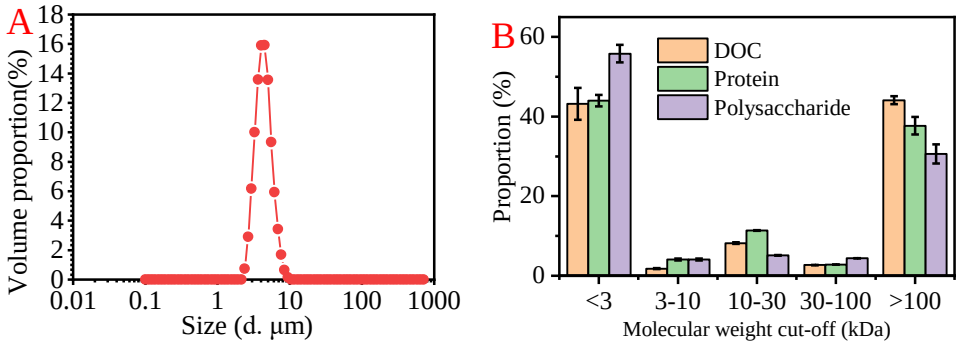


**Figure S1. (A) Size distributions of *Microcystis aeruginosa*, (B) Molecular weight distribution of the EOM sample**

## DOC of UF permeate with different pretreatment

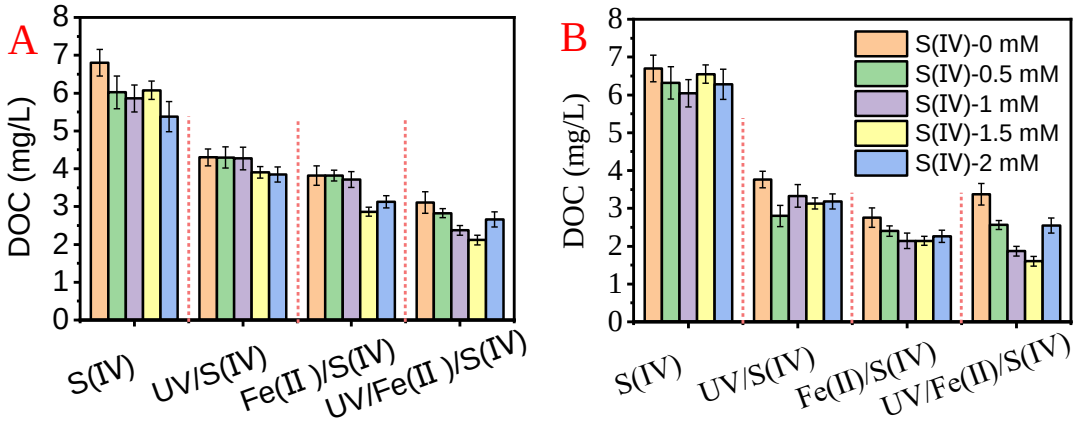


**Figure S2. Permeate water DOC in varying systems treating (A) EOM solution and (B) ALW.**

## Normalized flux of EOM filtration in different pretreatment system with varying S(IV) dosages.

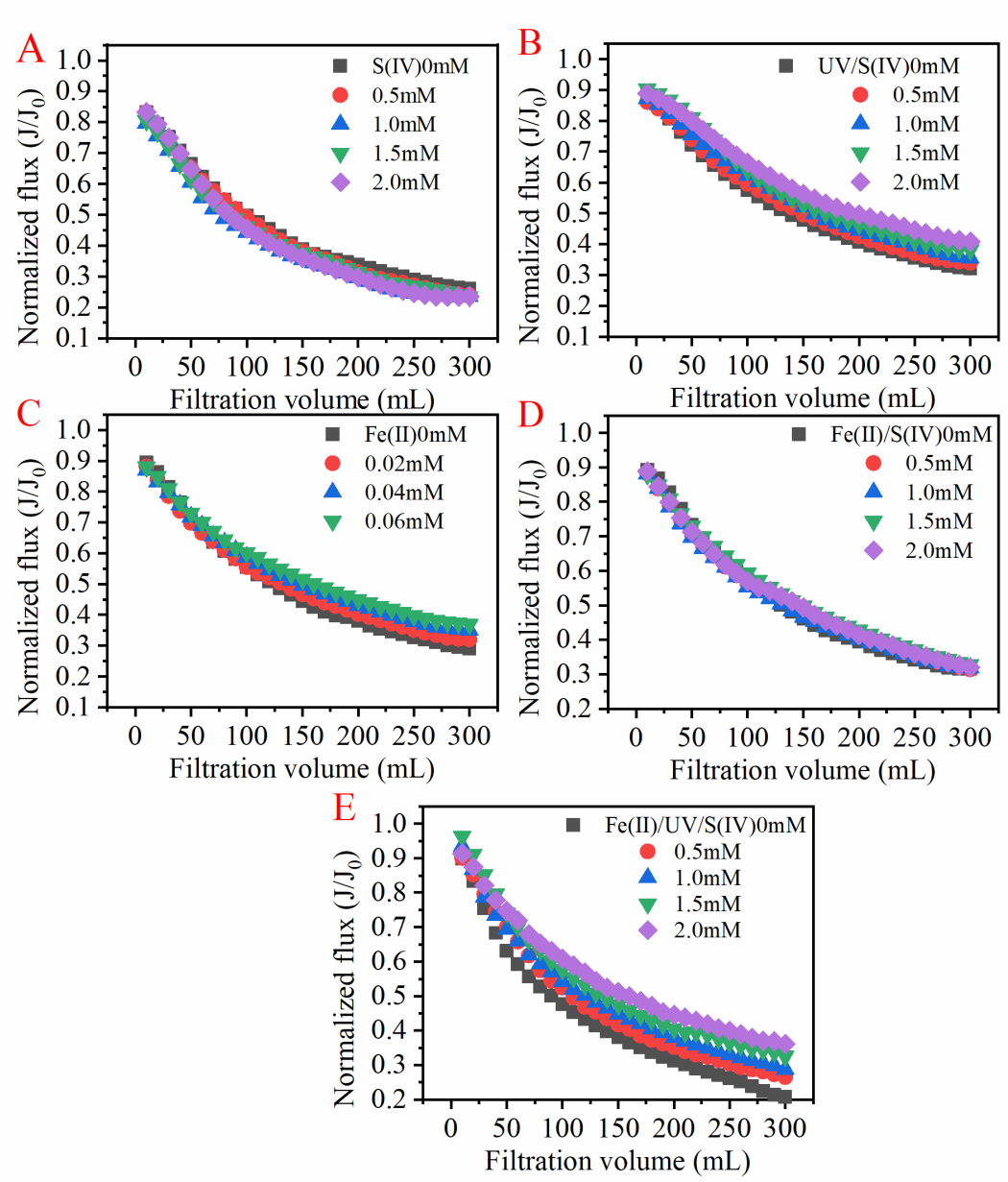


**Figure S3. Membrane flux decline with varying S(IV) dosages in different pretreatments treating EOM (A) stand-alone S(IV) ALW, (B) UV/S(IV), (C) stand-alone Fe(II), (D) Fe(II)/S(IV) and (E) UV/Fe(II)/S(IV).**

## Membrane fouling resistance of EOM filtration in different pretreatment system with varying S(IV) dosages

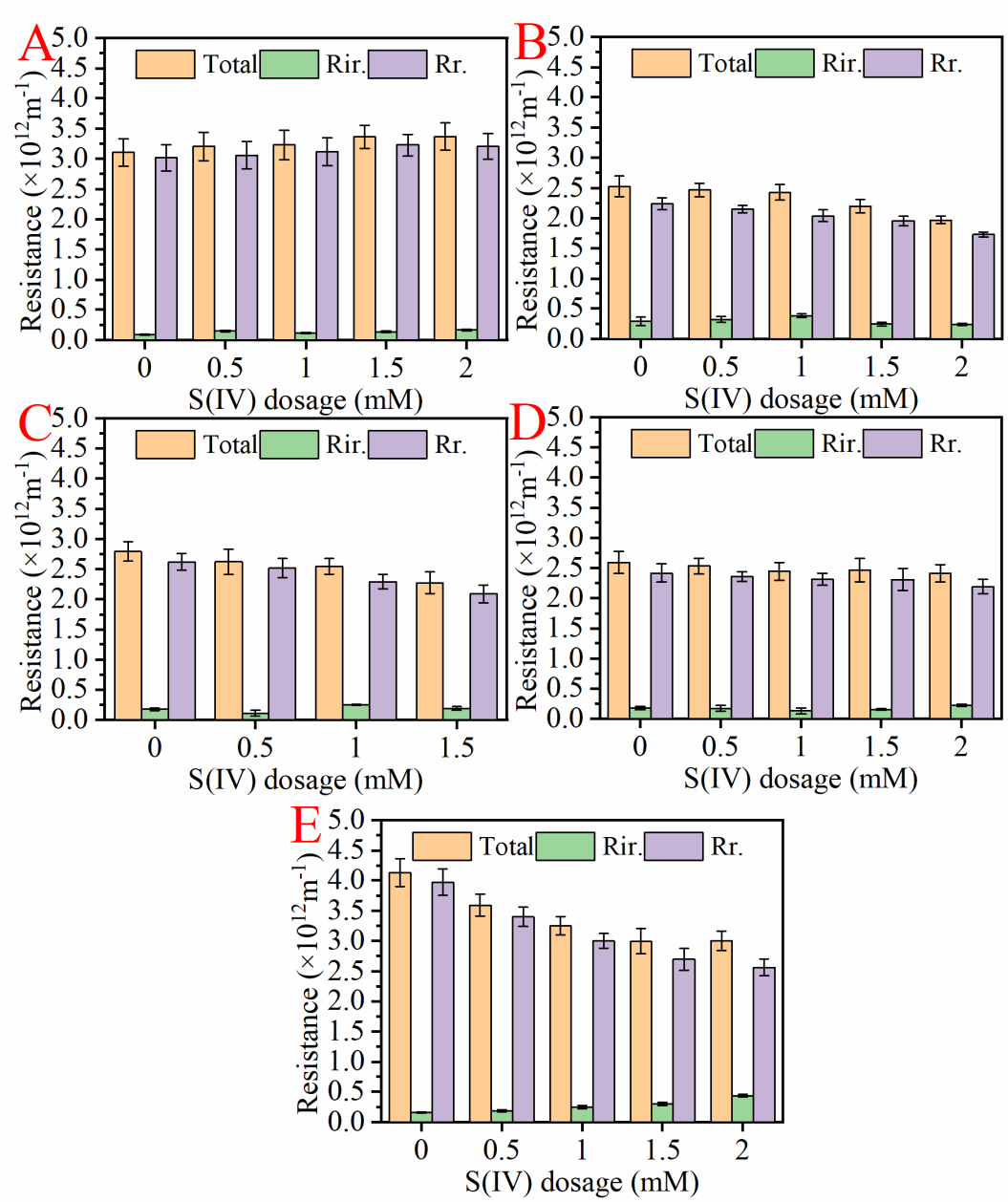


**Figure S4. Membrane fouling resistance with varying S(IV) dosages in different systems treating EOM (A) stand-alone S(IV) ALW, (B) UV/S(IV), (C) stand-alone Fe(II), (D) Fe(II)/S(IV) and (E) UV/Fe(II)/S(IV).**

## Specific flux of ALW filtration in different pretreatment system with varying S(IV) dosages

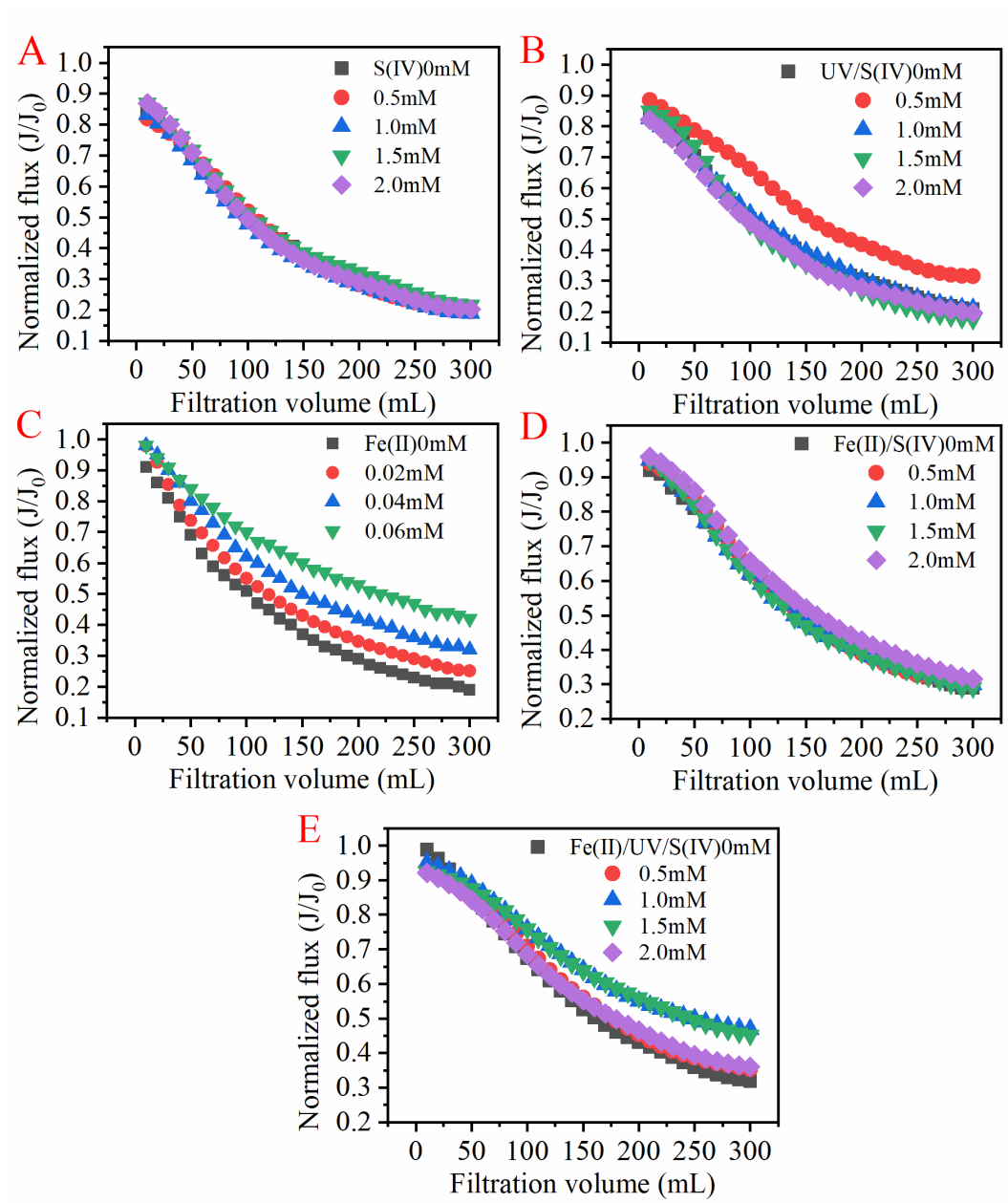


**Figure S5. Membrane flux variation with varying S(IV) dosages in different systems treating ALW (A) stand-alone S(IV) ALW, (B) UV/S(IV), (C) stand-alone Fe(II), (D) Fe(II)/S(IV) and (E) UV/Fe(II)/S(IV).**

## Membrane fouling resistance of ALW filtration in different pretreatment system with varying S(IV) dosages

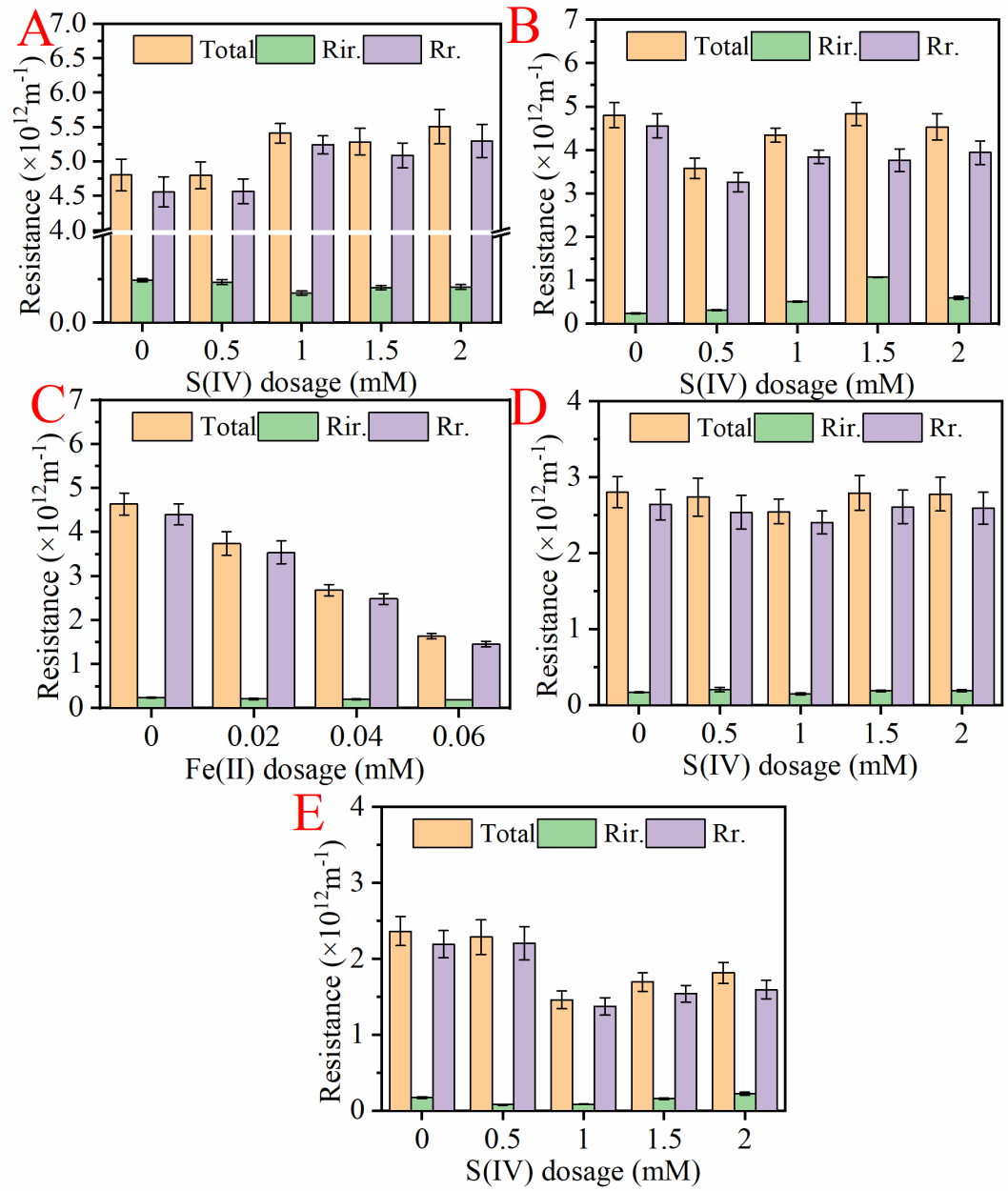


**Figure S6. Membrane flux variation with varying S(IV) dosages in different systems treating ALW (A) stand-alone S(IV) ALW, (B) UV/S(IV), (C) stand-alone Fe(II), (D) Fe(II)/S(IV) and (E) UV/Fe(II)/S(IV).**