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Utilizing Sulfate Radical-based Advanced Oxidation Processes for the degradation of textile dye Reactive Blue 19

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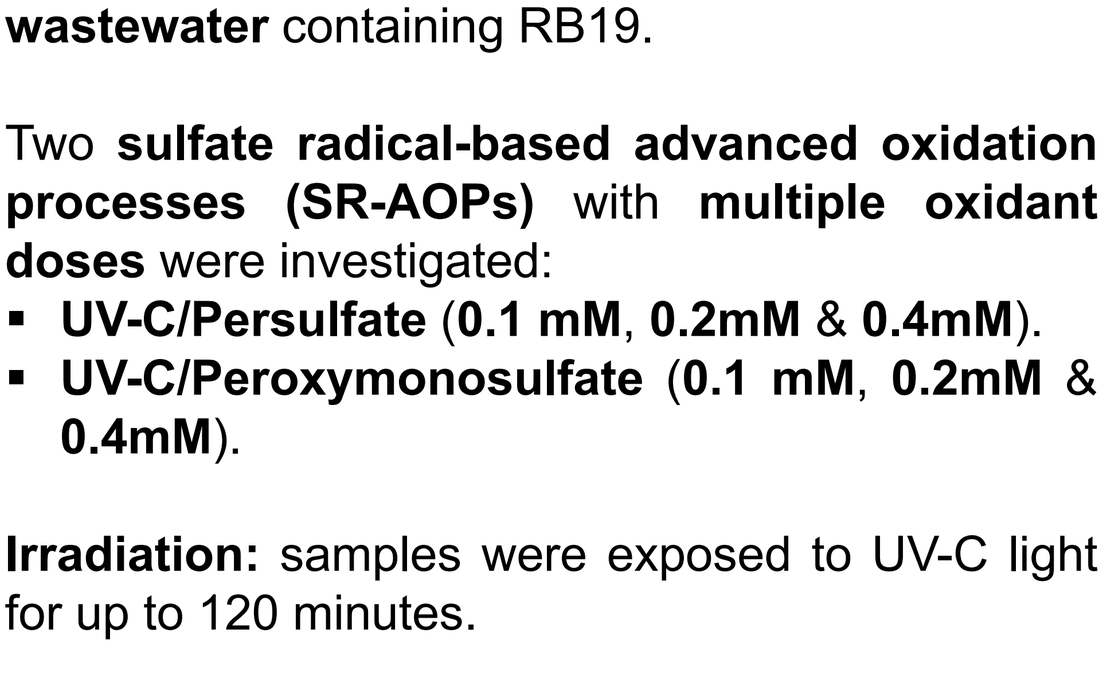
INTRODUCTION & AIM

- **Reactive Blue 19** (RB19) is a widely used **anthraquinone dye** in the textile industry, which is **persistent** in **aquatic environments** [1].
- **Textile industry effluents** containing synthetic dyes **deteriorate water quality**, promote excessive algal growth and reduce light penetration, thereby **disrupting** aquatic life and **ecological balance** [1].
- **Advanced Oxidation Processes** (AOPs) are **promising alternatives** for the degradation of recalcitrant pollutants [2].
- **Aim:** To evaluate the **efficiency** of **two Sulfate Radical-based AOPs — UV-C/Persulfate** (PS) and **UV-C/Peroxymonosulfate** (PMS) — for the degradation of RB19 in simulated textile wastewater.

METHOD

- Experiments were carried out in **simulated textile wastewater** containing RB19.
- Two **sulfate radical-based advanced oxidation processes (SR-AOPs)** with **multiple oxidant doses** were investigated:
  - **UV-C/Persulfate** (**0.1 mM**, **0.2mM** & **0.4mM**).
  - **UV-C/Peroxymonosulfate** (**0.1 mM**, **0.2mM** & **0.4mM**).
- **Irradiation:** samples were exposed to UV-C light for up to 120 minutes.
- **Monitoring:** dye degradation was quantified spectrophotometrically.



RESULTS & DISCUSSION

- ✓ Maximum degradation reached **~88% within 120 minutes** at the highest oxidant concentrations.
- ✓ **Kinetics:** the degradation followed a **pseudo-first-order model.**
- ✓ The efficiency is attributed to the in-situ generation of **sulfate ($SO_4^{\bullet-}$)** and **hydroxyl (HO•) radicals** under UV-C activation.

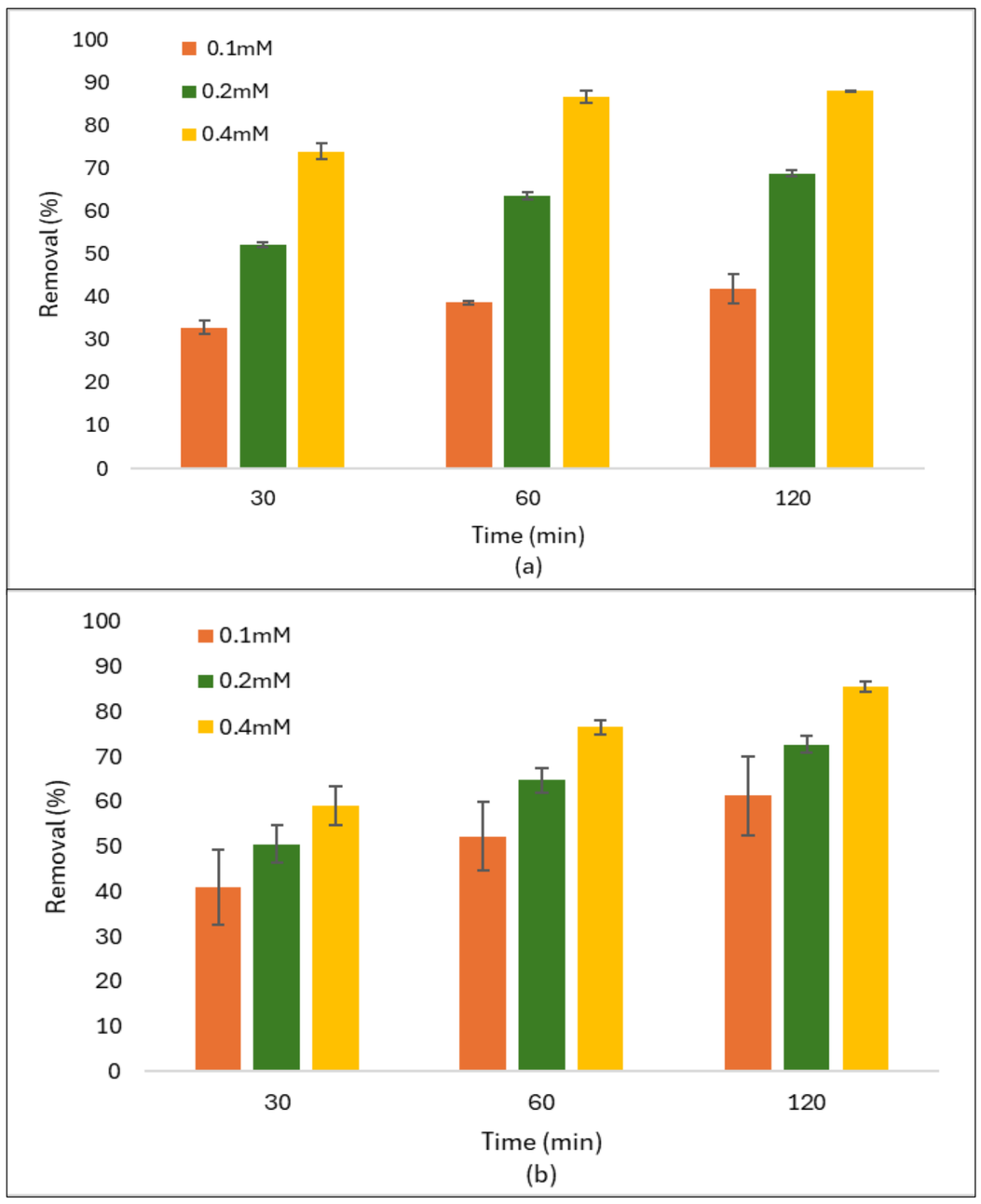


Figure 1: Effects of a) PS and b) PMS concentration, on RB19 degradation, under UV-C irradiation.

CONCLUSION

- **Both processes** showed **similar effectiveness** and **operational flexibility**, making them **suitable candidates** for textile wastewater treatment.
- **SR-AOPs** are **viable technologies** for efficient degradation of recalcitrant organic dyes.

REFERENCES

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