

Organic Polymer Photocatalysts for Hydrogen Production and Micropollutant Oxidation in Wastewater

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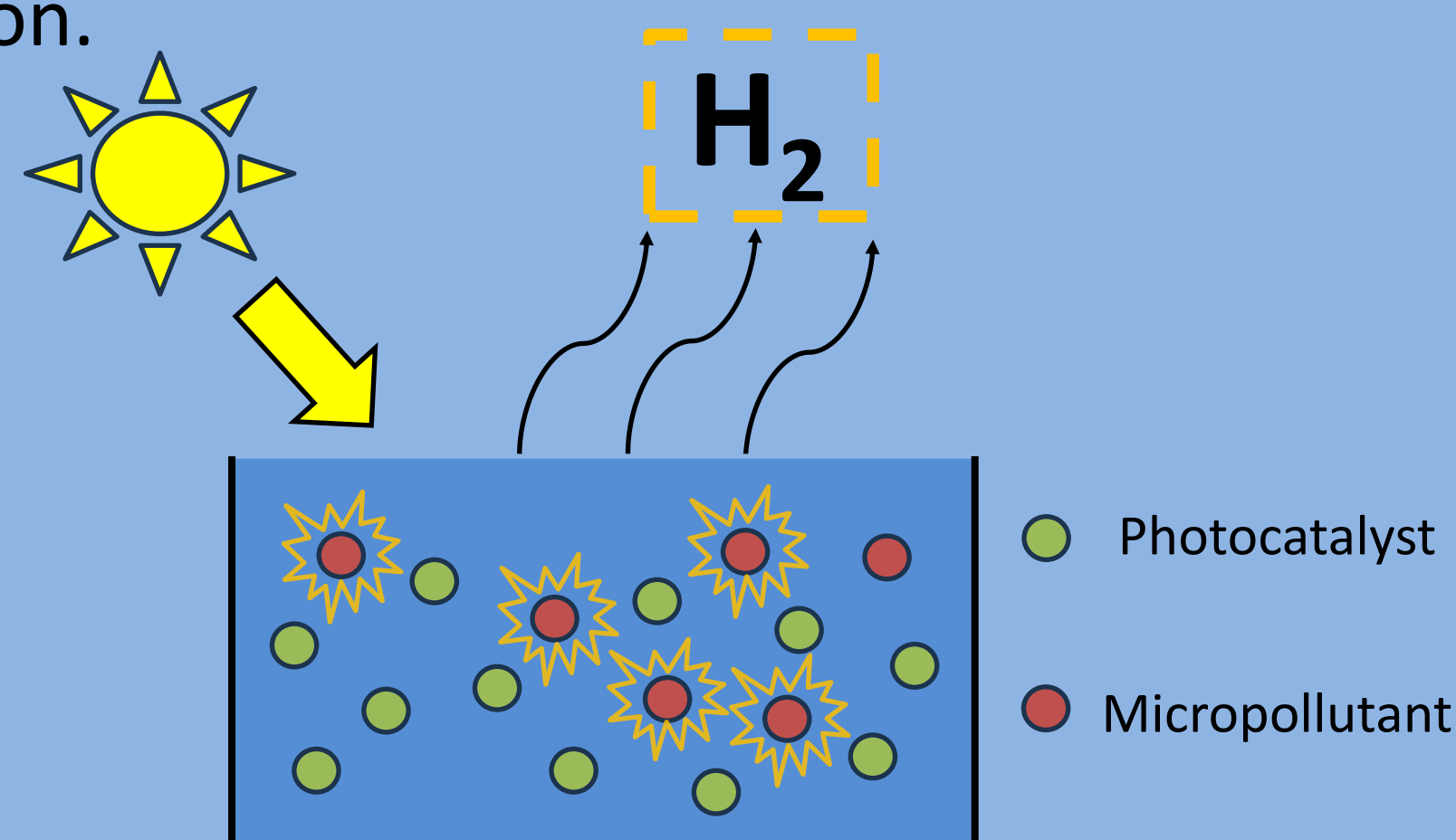
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Introduction – Solar Fuels!

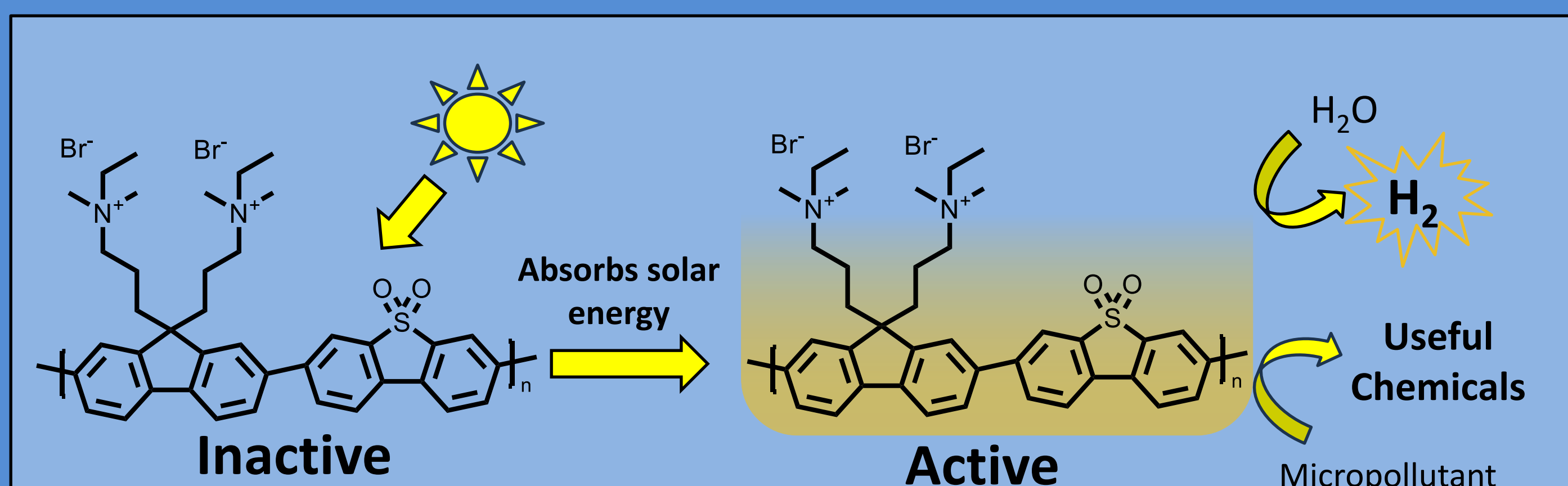
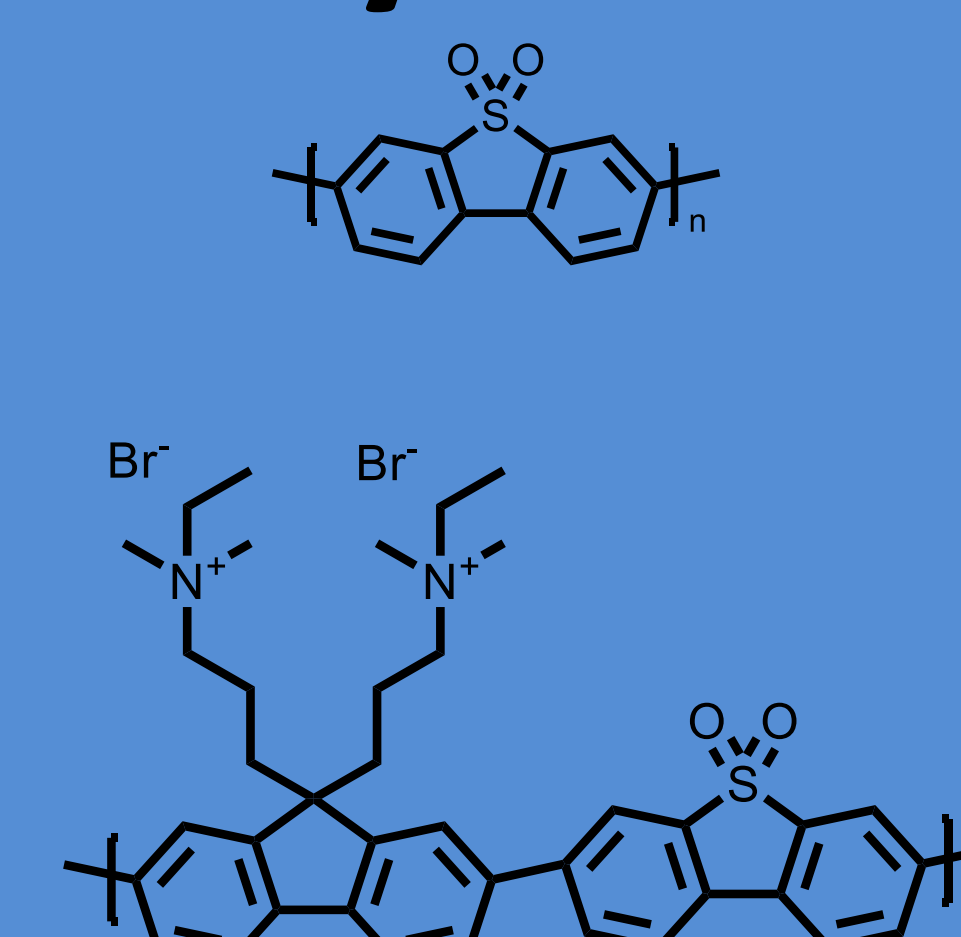
What are solar fuels? – Conversion of solar energy into chemical energy!

- ☀ Produces green **hydrogen** from water to mitigate climate change.
- ☀ Only 3 components: **Water**, the **Sun** and a **Photocatalyst**.
- ☀ Photocatalysts can simultaneously **purify** micropollutants by oxidation.



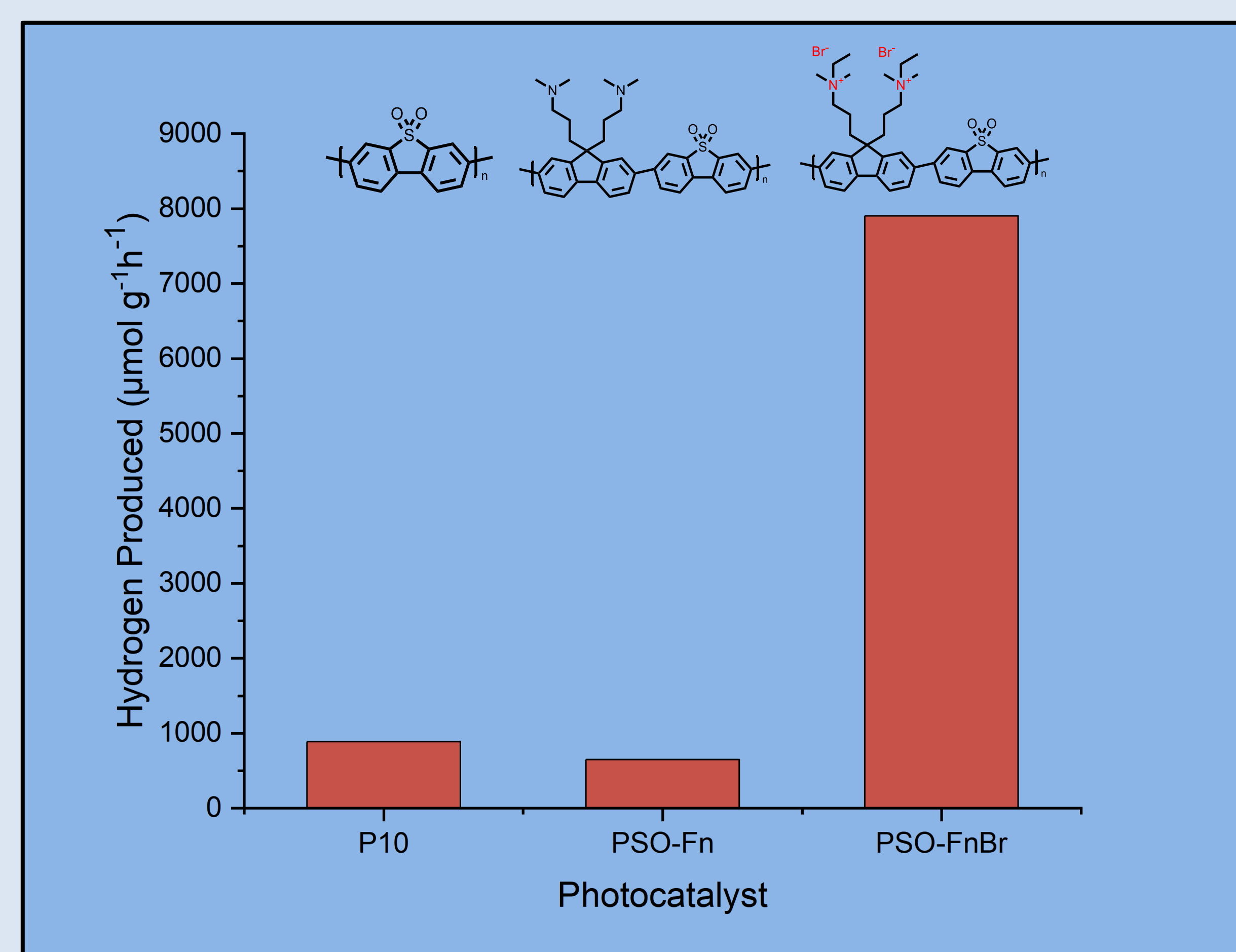
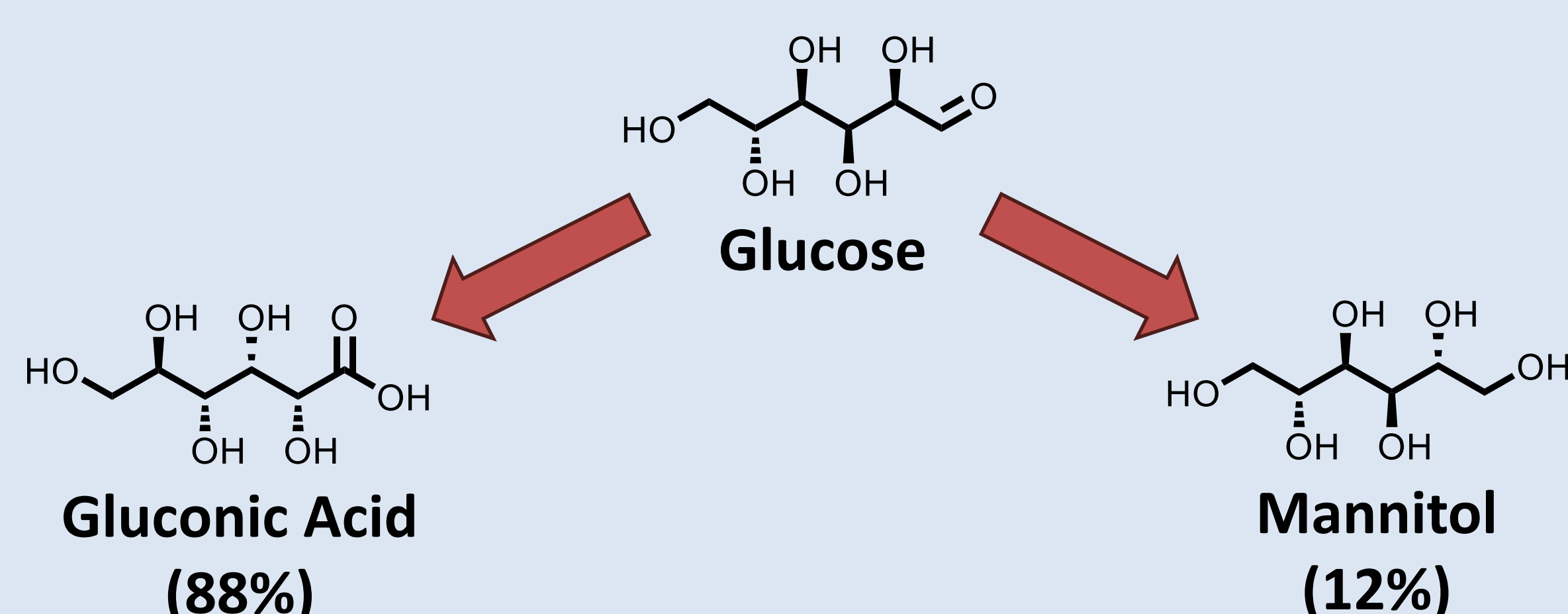
Why Polymer Photocatalysts?

- ☀ Cheap non-metal building blocks.
- ☀ Suitable energy levels for solar light absorption
- ☀ Stable and robust.
- ☀ Can be cast as thin films – scalable.



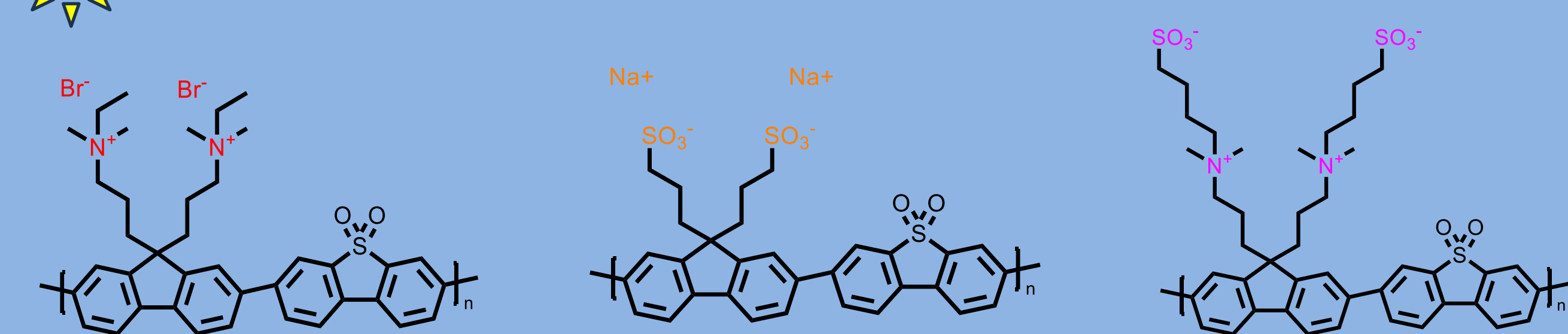
Results – H_2 Production and Oxidation of Organics

- ☀ Successful photocatalytic hydrogen production from a 0.1 M glucose solution.
- ☀ Polymers with ionic side chains show much greater efficiency.
- ☀ Glucose was simultaneously oxidised into gluconic acid and mannitol.
- ☀ Potential for pollutants with similar structures to be oxidised.

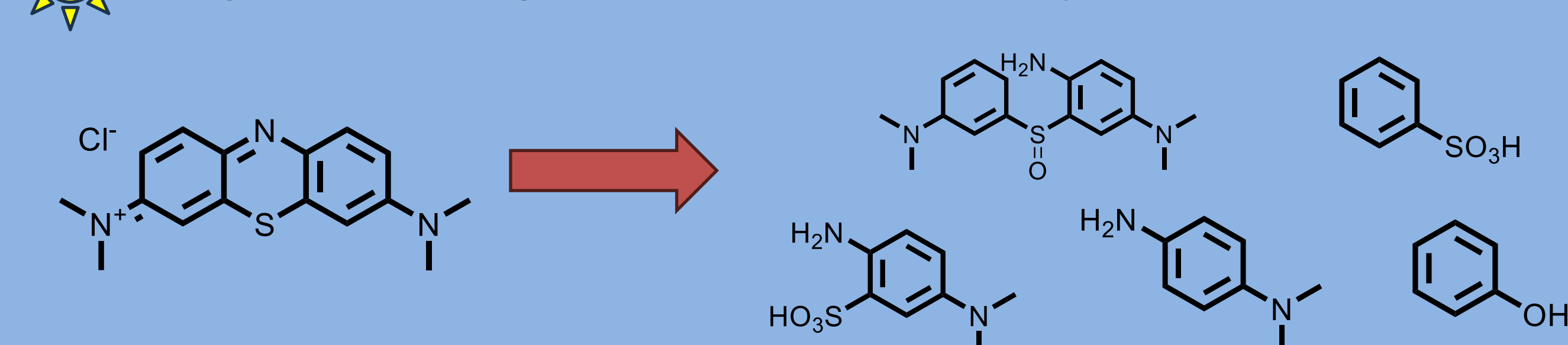


Future Research

- ☀ Investigate the effects of other ionic polymers.

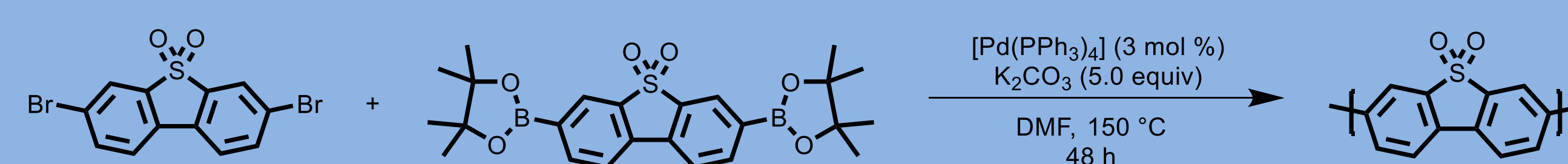


- ☀ Begin evaluating the oxidation of micropollutants. [1]



Methods

- ☀ All conjugated polymers were synthesised through standard Suzuki-Miyaura cross-coupling reactions.



- ☀ Photocatalysis experiments were performed under the following conditions:

- 300 W Xenon light source with >420 nm visible light filter.
- 20 mg polymer photocatalyst dispersed in 25 mL 0.1 M glucose(aq) adjusted to pH 12 by addition of NaOH.
- All O_2 removed from solution by purging with N_2 .
- GC-MS used to analyse glucose oxidation products

Acknowledgements

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References

[1] Houas, A. *et al.* Applied Catalysis B: Environmental 31, 145–157 (2001)