Biomimetic oxygen scavengers

From theory to field

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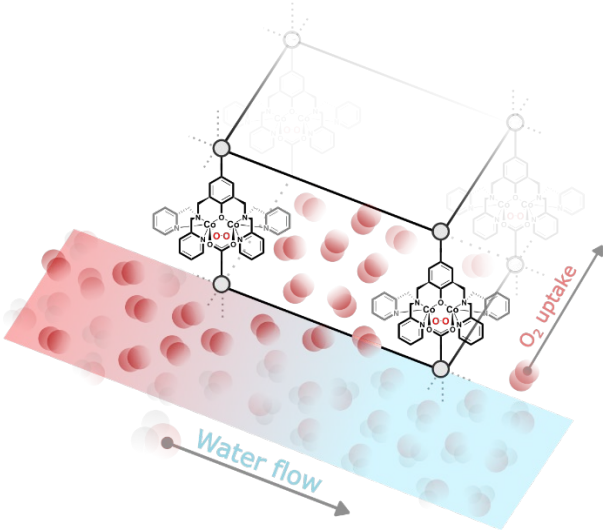
Produced water (PW) is a by-product of oil extraction and contains a mixture of dispersed and dissolved oil. Reinjection of PW into the reservoir is an important tool to reduce the discharge of potentially harmful substances. For that, the PW is mixed with seawater containing high levels of dissolved oxygen which causes corrosion and bacterial growth. Currently, the removal of oxygen relies on the excessive use of chemical additives.



To mitigate this, our project aims to develop new types of metal-organic frameworks (MOFs) tailored for oxygen adsorption. MOFs are porous coordination polymers that form via the self-assembly of inorganic nodes and organic linkers. The surface area and chemical functionality can be tuned by careful choice of building blocks. This makes MOFs attractive materials for use as selective adsorbents. Specifically, the project aims to prepare MOFs based on linkers that integrate accessible secondary metal sites. Such sites can bind molecular oxygen via partial electron transfer similar to biological oxygen-transport proteins.

The project will combine experimental work with computational modelling. The materials will be implemented in a micro-scale reactor to obtain adsorption/desorption isotherms under simulated conditions. The experimental data will be used to develop computational models to support the design of pilot- and full-scale packed bed reactors. Ultimately, the goal is to transform theory into field operation.