

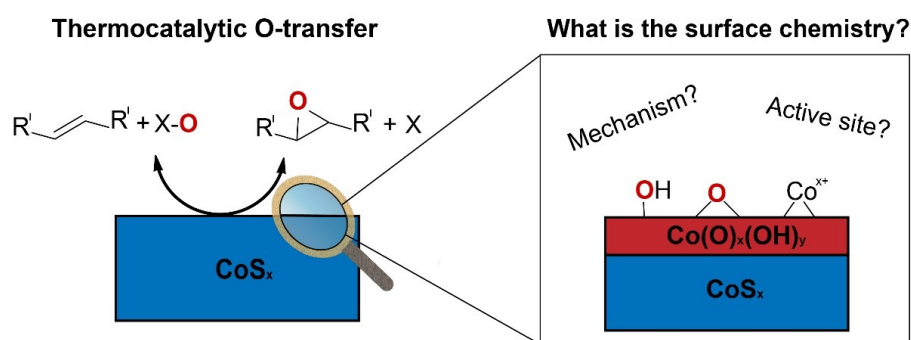
## The Surface Chemistry of Cobalt Sulfide in Thermo-Catalytic Oxygen Transfer Reactivity

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New advances in heterogeneous catalysis have often been achieved by applying known principles from related fields of molecular or enzymatic catalysis.<sup>1</sup> Here we get inspired by well-known principles from electrocatalysis of earth-abundant materials for the discovery of new thermo-catalytic reactions by these materials. Specifically, cobalt sulfide materials ( $\text{CoS}_x$ ) have shown high activity for the electro-catalytic oxygen evolution reaction (OER)<sup>2-3</sup>, and we hypothesized that these materials might also be active catalysts for thermal oxygen transfers.

We show that  $\text{CoS}_x$  can indeed catalyze thermal epoxidations and epoxide deoxygenations and outperform as-synthesized cobalt -oxide, -hydroxide, and -oxyhydroxide. This is curious as the  $\text{CoS}_x$  oxidize during epoxidation reactions, similarly to OER where the sulfides oxidize under the highly oxidative conditions.<sup>2-4</sup> Under the milder epoxide deoxygenations conditions, on the other hand, bare  $\text{CoS}_x$  remains exposed, suggesting an intrinsic oxygen transfer activity of the sulfides. In this poster we discuss parallels between the electro- and thermo-catalytic oxygen transfers by  $\text{CoS}_x$  in terms of surface chemistry, active species, and mechanism based on preliminary spectroscopic and mechanistic investigations. This work provides new insight into more insight into key structure-reactivity relationships on  $\text{CoS}_x$  surfaces and shows the utility of taking inspiration from different fields to make new discoveries in catalysis.



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