

Exploration of H_2O_2 Scission Kinetics on
S-Modified Group IV Metals Utilized to
Degrade Refractory Pollutants

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$\cdot OH$ is regarded as one of powerful oxidants utilized to decompose recalcitrant. $\cdot OH$ can be produced via catalytic H_2O_2 cleavage on S-modified $Fe^{\delta+}$ species ($\delta \leq 2$) inherent to iron sulfides. The resulting $\cdot OH$ species produced, yet, are found insufficient to fully oxidize the recalcitrants because of the limited $\cdot OH$ productivity and chemical susceptibility $Fe^{\delta+}$ species can impart. To locate S-modified metal species ($M^{\delta+}$, M: metal) that can outperform the $Fe^{\delta+}$ counterparts with regards to H_2O_2 scission coupled with chemical sturdiness, here we synthesize five Group IV metal sulfides, whose geometries (hexagonal) and chemical formula (MS) are identical one another. $Ni^{\delta+}$ species are identified to provide the greatest H_2O_2 scission rate and phenol consumption rate among the $M^{\delta+}$ species studied and therefore are located in the middle of the volcano-shaped curve plotting $-r_{H_2O_2, 0}$ (or $-r_{PHENOL, 0}$) versus $M^{\delta+}$. Electric potential-assisted control runs corroborate that $\cdot OH$ desorption is the rate-determining step and that the $Ni^{\delta+}$ species are most appropriate to release $\cdot OH$ species, while minimizing the leaching issue among all $M^{\delta+}$ species examined.