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Investigating the impact of {Fe²⁺}:{HS⁻} ratio on FeS formation

Introduction

FeS formation ~63-fold investigated Here, at Mackinawite(FeS) is the first iron sulfide phase to form in anoxic sulfidic environments. Moreover, its we supersaturation, varying {Fe²⁺}:{HS⁻} and pH 10.2. We catalytic properties make it a potential candidate for a variety of industrial applications including energy explored the particle size distributions via Dynamic Light storage systems and CO₂ conversion. This together with Mackinawite's potential for remediation through Scattering(DLS), the particles' ς -potential via Electrophoretic the doping of heaving metal cations makes it an interesting subject of investigation. In natural and Light Scattering(ELS) and morphology/crystallinity using engineered conditions, iron and sulfide do not generally occur in alike concentrations. Therefore, Microscopy(TEM) Electron Transmission and X-Ray investigating the impact of diverging ratios of iron:sulfide activities (non-stoichiometry) will improve our Figure 1: Experiments were conducted in a Nitrogen filled GP-Campus Jacome Diffraction(XRD) analysis. knowledge about iron sulfide formation in these settings. glovebox with Oxygen level \simeq 0ppm.





Alemeh Karami, Janou Koskamp and Mariëtte Wolthers

Department of Earth Sciences, Faculty of Geosciences, Utrecht University, The Netherlands





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Conclusions

Particle formation mechanism is sensitive to the imbalance of ${Fe^{2+}}$: {HS⁻} in the solution.

- * Results indicated non-linear evolution of particle size through time.
- * Higher concentrations of sulfide gave rise to smaller particles, whereas having more or equal amounts of iron induced larger particles to form.
- * Surface charge of particles is affected by the ratio of cation: anion. **Presence of more Fe(II) lead to less negative net surface charge and** extra sulfide lead to more negative surface charge.
- This behavior may be explained by two factors:
- The central role of Fe in the Mackinawite structure(Fig. 8), in which Fe atoms share S atoms in the corners of FeS tetrahedrons. Therefore, a lack of Fe²⁺ may limit the growth of FeS more strongly.
- **2.** the ς -potential value, which reflects the surface charge of the particles. When zeta potential is within the range of $\sim \pm 30$ mv colloids are less stable and more prone to aggregation.

Faculty of Geosciences Department of Earth Sciencecs





Figure 8: Schematic representation of structure of Mackinawite (Wolthers et al. 2005. <u>https://doi.org/10.1016/j.gca.2005.01.027</u>)