Chemistry and the World Around Us

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Making Minerals (Greenocite)

The Chemical Process

\[
\text{Cd}^{2+} \quad \text{S}^{2-} \\
\text{Cd}^{2+} \quad \text{S}^{2-} \\
\text{Cd}^{2+} \quad \text{S}^{2-} \\
\text{Cd}^{2+} \quad \text{S}^{2-} \\
\text{Cd}^{2+} \quad \text{S}^{2-} \\
\text{Cd}^{2+} \quad \text{S}^{2-} \\
\]
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The Question

\[ \text{Cd}^{2+} + \text{S}^{2-} \rightarrow \text{CdS} \]
How do we address the question?

Understanding Metal Cluster Formation

\[ \text{Cd}^{2+} \text{S}_2^- \text{Cd}^{2+} \text{S}_2^- \]

- Mass Spectrometry
- UV-VIS Spectroscopy
- Electrochemistry

- Stoichiometry \((\text{Cd}_x\text{S}_y)\)
- Small Clusters
- Lab Technique
- Cluster size
- Large Clusters
- Lab Technique
- Metal:Sulfur
- All Sizes
- Field Sampling
What is Mass Spectrometry?
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FT-ICR MS
What is Mass Spectrometry?
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Getting at the Answer...
Any Questions?
How did I get here?
Any Questions?
Previous Experiments

LDI FT-ICR MS Results

Experimental Issues

- Laser Desorption Ionization
- Harsh ionization method
- Reproducibility
- MS/MS
Previous Experiments

**ESI FT-ICR MS**

**High Performance MS**

- < 1 ppm mass accuracy
- Resolving power approaching 100,000
- High Resolution allows for isotopic distribution comparison
Results

UV-VIS experiment

Electrochemical Analysis
Structure of Greenockite