MINSC meeting Tuscany

- Publications:
  Collaboration on a paper with Hwakins and Jamtveit (Oslo)
- Other:
  Beamtime proposal Diamond
  Abstract Goldschmidt 2015

6. Any significant research progress during the reporting period or a summary of work during the reporting period (a short paragraph to be posted on the MINSC website)

Tentative TOC PhD thesis

1. **Introduction**
   - 1.1. Background
   - 1.2. Aims and Objectives
   - 1.3. Thesis outline
2. **Literature review**
   - 2.1. Phases of silica
     - 2.1.1. Amorphous silica
   - 2.2. Dissolution of amorphous silica
     - 2.2.1. Dissolved silica
   - 2.3. Precipitation of amorphous silica
     - 2.3.1. Polymerisation and nucleation
     - 2.3.2. Particle growth and ripening
     - 2.3.3. Particle aggregation
     - 2.3.4. Precipitation and adhesion
   - 2.4. Formation of amorphous silica under geothermal conditions
     - 2.4.1. Inorganic precipitation in geothermal power plants
     - 2.4.2. Interaction between silica and organic molecules
3. **Materials and methods**
   - 3.1. Scaling plate experiments Hellisheidi
     - 3.1.1. Experimental design and sampling protocol
     - 3.1.2. Stereo microscope
     - 3.1.3. Scanning electron microscopy (SEM) (including EDS)
     - 3.1.4. X-ray diffraction (XRD)
     - 3.1.5. X-ray fluorescence (XRF)
     - 3.1.6. Solution analyses
   - 3.2. Characterisation of silica precipitates from a geothermal heat exchanger
     - 3.2.1. Sampling and sample preparation
     - 3.2.2. Stereo microscope
     - 3.2.3. Scanning electron microscope (SEM)
     - 3.2.4. X-ray diffraction (XRD)
     - 3.2.5. Thermogravimetric analyses (TGA)
     - 3.2.6. Nuclear magnetic resonance (NMR)
     - 3.2.7. Surface area determination
     - 3.2.8. X-ray computer tomography (CT)
   - 3.3. Formation of silica-lysozyme composites by coprecipitation and adsorption
     - 3.3.1. Experimental setup
     - 3.3.2. Transmission electron microscopy (TEM)
     - 3.3.3. Pair distribution function (PDF)
     - 3.3.4. Quantitative Fourier-transform infrared spectroscopy (FTIR)
     - 3.3.5. C and N content by mass spectrometer
     - 3.3.6. Determination of zeta potential
     - 3.3.7. Thermogravimetric analyses (TGA)
     - 3.3.8. Surface area determination
   - 3.4. Mechanism of formation of silica-lysozyme composites
     - 3.4.1. Precipitation experiments
     - 3.4.2. Transmission electron microscope (TEM)
     - 3.4.3. Spectrophotometric molybdate yellow method
     - 3.4.4. Turbidimetry using the UV-Vis
     - 3.4.5. Small-angle X-ray scattering (SAXS)
     - 3.4.6. Ev. Dynamic light scattering (DLS)
4. **Microstructures and compositions of silica rich scales from pipelines at the Hellisheiði power station, Iceland** (1st results chapter) → MinMag paper
   - 4.1. Abstract
   - 4.2. Introduction
   - 4.3. Materials and methods
   - 4.4. Results
   - 4.5. Discussion
   - 4.6. Conclusion
5. **Mechanism and formation rates of amorphous silica scales from geothermal solutions and the effect of surface properties on precipitation** (2nd results chapter)
   - 5.1. Abstract
   - 5.2. Introduction
   - 5.3. Materials and methods
   - 5.4. Results
   - 5.5. Discussion
   - 5.6. Conclusion
6. **Silica precipitation inside a geothermal heat exchanger reduces production of thermal energy: a case study form the Hellisheiði geothermal power station** (3rd results chapter)
   - 6.1. Abstract
   - 6.2. Introduction
   - 6.3. Materials and methods
   - 6.4. Results
   - 6.5. Discussion
   - 6.6. Conclusion
7. **Characterisation of silica-lysozyme composites formed by coprecipitation and adsorption** (4th results chapter)
   - 7.1. Abstract
   - 7.2. Introduction
   - 7.3. Methods
   - 7.4. Results
   - 7.5. Discussion
   - 7.6. Conclusion
8. **Formation of silica-lysozyme composites: a mechanistic study** (5th results chapter)
   - 8.1. Abstract
   - 8.2. Introduction
   - 8.3. Methods
   - 8.4. Results
   - 8.5. Discussion
   - 8.6. Conclusion
9. **Summary and concluding remarks**