

Job # 691887

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Description Type

What Your Job Will Be Like

The Geochemistry Department seeks a dedicated and motivated postdoctoral research scientist to join the newly funded Energy Earthshot Research Center “Center for Coupled Chemo-Mechanics of Cementitious Composites for EGS.” The postdoctoral scientist will investigate phase transformations during chemical activation of earth-abundant materials at elevated temperatures with the goal of creating solidified cementitious materials. Specifically, we will identify chemical mechanisms that dictate the molecular- to nm-scale chemical processes during the activation and phase transformations of cementitious materials under hydrothermal conditions. This research will determine how the fundamental properties of montmorillonite clay mineral particles control the pore volume, pore connectivity, and structure in the solidified porous media and the nano- to cm-scale mechanical properties of the solidified composites. The planned experimental research will entail using Raman spectroscopy with high-temperature cell to track phase transformations in situ. Additionally, various Parr reactors will be utilized for long-term ageing of cementitious composites to test specific hypotheses about reaction pathways and products. The selected applicant will perform laboratory experiments, analyze data, and write peer-reviewed publications. This position includes close collaboration with subsurface engineering experts in the field of enhanced geothermal energy, as well as material scientists and experts in geomechanics. There will be opportunities to further develop various aspects of this evolving research project.

On any given day, you may be called on to:

- Design and perform high-temperature hydrothermal experiments in the geochemistry laboratory
- Prepare clay mineral substrates with controlled properties
- Utilize a variety of analytical techniques to characterize pre- and post-reaction materials
- Analyze and interpret chemical/geochemical data
- Read and summarize relevant literature
- Write manuscripts for peer-reviewed journals
- Conduct work in a multi-disciplinary team environment
- Attend and present at technical conferences or program meetings

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Qualifications We Require

PhD in geology, geochemistry, environmental chemistry, materials science, chemical engineering, or a related field

Experience working in a chemistry laboratory

Experience in analytical chemistry method development and optimization

Experience with analytical techniques for aqueous and solid phases, especially compositional analysis and phase identification

Strong understanding of the mineralogy field

Experience publishing in peer-reviewed journals

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Qualifications We Desire

- Experience running high temperature hydrothermal experiments
- Experience with Raman spectroscopy
- Ability to plan and complete technical work
- Experience with designing and carrying out laboratory experiments
- Ability to understand and work with a diverse set of experimental techniques
- Experience working in multi-disciplinary teams
- Ability to work independently and in a team environment showing initiative and leadership
- Strong written and verbal communication skills
- Commitment to safety, security, and quality of research
- Ability to present research findings at national and international meetings

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About Our Team

The Geochemistry Department has expertise in three areas: 1) molecular-scale modeling, 2) experimental geochemistry, and 3) applied environmental/chemical engineering. We tackle geosciences-related problems with an application for carbon sequestration, non-traditional oil and gas recovery, nuclear waste management, and environmental remediation. Many of these problems require understanding of chemical effects on mechanical properties in natural and manmade materials. This new research program is further extending out research on chemical effects on fracture, coupled chemical-mechanical effects in crystalline materials, and coupling of geochemistry and geomechanics in layered rocks (shales). Computing facilities for molecular modeling include a cluster (CPU nodes, GPU nodes) maintained by the Geochemistry Department as well as the Sandia High Performance Computing. In addition, we have 3,000 square feet of laboratory space that includes the following analytical equipment: inductively coupled plasma mass spectrometry, Raman microscopy, UV-vis spectrophotometry, vapor sorption analyzers, X-ray diffractometer, Fourier transform Infrared spectrometer, Bruker Premier TriboIndenter, and Scanning electron microscopy.