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The construction and implementation of a small angle light scattering instrument as a micron-scale structural probe of porous systems[1]
GREGGORY MCPHERSON, New Mexico State University, GEOCHEMISTRY AND INTERFACIAL SCIENCES GROUP, OAK RIDGE NATIONAL LABORATORY COLLABORATION — The ability to measure changes in the porosity of materials across multiple length scales as a function of chemical and physical processes is of interest to research from energy storage to long-term remediation of environmental pollutants. Ultra-small and small-angle neutron scattering have proven effective in studying structural features from nanoscopic to mesoscopic scales, but are limited in their ability study larger features. Employing longer wavelengths, small-angle light scattering (SALS) is able to probe structural features from one to hundreds of microns, bridging the gap in accessible Q-range between neutrons at smaller length scales and quantitative large-scale structural data extractable from electron microscopy. Though SALS has been well developed for studying polymers and biomolecules, its applications in solid multiphase systems is less established. To test the application of this technique to measuring changes in multi-scale porosity of geological rock samples subject to geochemical processes, a SALS instrument was designed and built by the Geochemistry and Interfacial Sciences group at Oak Ridge National Laboratory. Here will be discussed the instrument's design, challenges, some initial data, and future applications.

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Greggory McPherson
New Mexico State University

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