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SANS from CO_2-saturated coals at conditions relevant to subsurface sequestration YURI MELNICHENKO, ORNL, ANDRZEJ RADLINSKI, Geoscience Australia, GANG CHENG, ORNL, MARIA MASTALERZ, Indiana Geological Survey, GEORGE WIGNALL, ORNL — Carbon dioxide (CO_2) is the greenhouse gas which makes the largest contribution to global warming and roughly one third of the United States' CO_2 emissions are generated by fuel-burning power plants. Capture and storage of CO_2 in underground geologic structures may significantly reduce CO_2 emissions to the atmosphere. Sequestration of CO_2 in unmineable deep coal seams is particularly attractive as many coal-burning power plants are located near sites potentially suitable for geological storage. It is widely assumed that CO_2 can be captured and retained in coals by virtue of several of mechanisms, such as fluid trapping of an "immobile phase" inside the pore space, adsorption to the pore surface and chemical bonding inside the organic coal matrix in the vicinity of pore walls. We report the results of the first small-angle neutron scattering (SANS) studies of several coals saturated with CO_2 at temperatures and pressures similar to those found in deep coal seams which are likely to be used for industrial-scale underground storage of CO_2. We found that the porous coal matrix may work to create absorbed fluid phase with the physical density much exceeding the density of the bulk fluid at the same thermodynamic conditions. Fluid densification is different in different coals which may explain the observed differences in sorption capacity and migration rates.

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