Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

CO_2 adsorption in a hierarchically structured carbon by SANS
LILIN HE, JITENDRA BAHADUR, YURI MELNICHENKO, CRISTIAN CONTESCU, NIDIA GALLEGO, Oak Ridge National Laboratory — This contribution investigated the high pressure adsorption behavior of CO_2 at T = 296 K in hierarchically structured carbon using small-angle neutron scattering (SANS) technique. We observed a strong densification of CO_2 in micropores accompanied by non-monotonic adsorption-induced pore deformation. Liquid-like density of CO_2 confined in the micropores was reached with increasing pressure to 20 bar, which corresponds to the relative pressure of P/P_{sat} ∼0.3. At P > 20 bar, density of confined CO_2 approached a plateau. The size of micropores first increases with pressure, reached a maximum at 20 bar, and then decreased with further increasing pressure. A complementary SANS experiment carried out on the same microporous carbon saturated with argon that is neutron-transparent and non-adsorbing inert shows no deformation of micropores at pressures up to ∼200 bars. This result proved that the observed deformation of micropores in CO_2 was an adsorption-induced phenomenon, caused by the solvation pressure - induced strain and strong densification of confined CO_2 in the micropores.

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Date submitted: 02 Dec 2015 Electronic form version 1.4