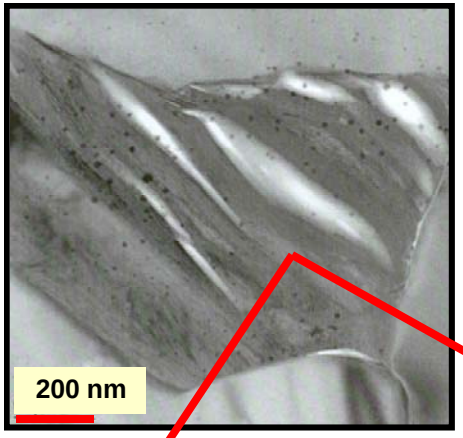
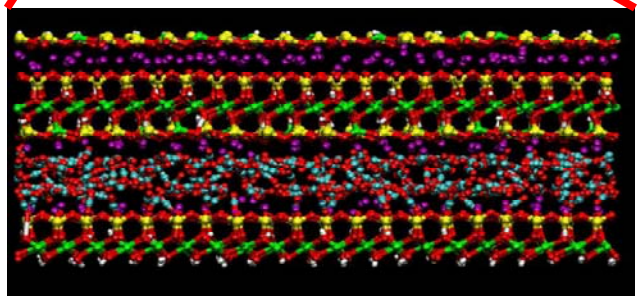
The role of Nature's nano-compartments in controlling the properties of CO_2

Cole, Chialvo, Rother, Vlcek, Cummings.
EFRC: Nanoscale Control of Geologic CO_2



TEM image of nano-porous clay



CO_2 molecules confined in mica

- Injection of CO_2 into subsurface geologic formations has been identified as a key strategy for mitigating the impact of anthropogenic emissions of CO_2

- The sealing properties of the cap rock depend on pore features, e.g. size and shape, as well as the properties of the pore fluid, such as density and interfacial tension

- Majority of cap rocks encountered in subsurface injection sites contains pores with sizes typically less than 100 nm and whose surface chemistries are dominated by quartz and clays.

- Neutron scattering experiments combined with theoretical models and molecular dynamics (MD) simulations indicate that significant amounts of supercritical CO_2 can be sequestered at relatively low pressures and the density of the nano-confined CO_2 may reach 3 times that of the bulk fluid.

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