## **Controlling CO<sub>2</sub> movement with nanoparticles**

## **Scientific Achievement**

Shown experimentally that the mobility of CO<sub>2</sub> analog fluid is reduced when it displaces a brine laden with suitably treated nanoparticles.

## **Significance and Impact**

 $CO_2$  is a low viscosity, high mobility fluid that moves through preferential paths through the subsurface. Our discovery raises the possibility of reducing the mobility of the  $CO_2$  only where needed, i.e. at incipient preferential paths. This can reduce the risk of leakage and increase the efficiency of  $CO_2$  storage. Research Details

- CO<sub>2</sub> and CO<sub>2</sub> analog fluids injected into sandstone cores with/without nanoparticles in the initial brine
- Measured patterns and saturations using CT scanning
- Preferential flow paths greatly reduced (see images)
- Low mobility phase likely the result of displacement processes creating micron droplets of CO<sub>2</sub> that are stabilized by the in-situ nanoparticles



Preferential paths of CO<sub>2</sub> analog (depicted in blue) observed in CT cross-sections without nanoparticles



Elimination of preferential paths in the presence of

nanoparticles D. A. DiCarlo, B. Aminzadeh, M. Roberts, D.H. Chung, S.L. Bryant, and C. Huh, "Mobility control through spontaneous formation of nanoparticle stabilized emulsions," Geophysical Research Letters, 38, L24404, 5 PP. doi:10.1029/2011GL050147 (2011).



