Multiphase Flow Characterization

- A large number of simulation studies have demonstrated the importance of understanding the multiphase flow properties of CO2/water systems for accurate characterization of the near-wellbore and long-term performance of CO2 storage. These studies show that the ultimate distribution of CO2 in the subsurface is sensitive to the choice of relative permeability characteristics, and that hysteresis in the relative permeability function plays a large role in determining the ultimate distribution of the CO2 plume, and that intra-reservoir capillary trapping can immobilize significant percentages of injected CO2 as a residual phase.

- A number of simulation studies have demonstrated the importance of understanding the multiphase flow properties of CO2/water systems for accurate characterization of the movement and immobilization of CO2 injected into the subsurface. These studies show that hysteresis in the relative permeability function plays a large role in determining the ultimate distribution of the CO2 plume, and that intra-reservoir capillary trapping can immobilize significant percentages of injected CO2 as a residual phase.

- The results for the Berea are shown with data from [3] for CO2/brine at 12.4 MPa pore pressure and 50°C on a Berea sandstone with 2.5% CO2. Low CO2 saturations persist, even at the highest fractional flow rates, as has been seen in previous studies.

- The characteristic saturation buildup and good matches for the pressure drop across the core could be obtained if the bulk core and barrier had permeabilities of 7.5 Darcy and 0.01 mD respectively.

- The results of the four drainage relative permeability tests are shown in the above figure. Relative permeability varies as expected with gas number of simulation studies have demonstrated the importance of understanding the multiphase flow properties of CO2/water systems for accurate characterization of the movement and immobilization of CO2 injected into the subsurface. The characteristic saturation buildup and good matches for the pressure drop across the core could be obtained if the bulk core and barrier had permeabilities of 7.5 Darcy and 0.01 mD respectively.