Geologic Storage of Carbon Dioxide in Depleted Hydrocarbon Reserves

Edward Matteo* and George Scherer
Department of Chemical Engineering, Princeton University

Session 4, Talk 2 (3:40 PM)

Carbon capture and storage (CCS) is emerging as a viable option for carbon mitigation. The *Intergovernmental Panel on Climate Change Third Assessment Report* (IPCC AR3) projections for carbon emission scenarios indicate a high sensitivity to the extent to which CCS is deployed. Several barriers to large-scale CCS implementation exist, and geologic storage in depleted petroleum reserves plays an important role in overcoming many of these obstacles.

Technical uncertainties regarding the potential for leakage of carbon dioxide from storage formations (herein referred to as "leakage") play an important role in the risk perception of CCS projects. Concern for leakage influences marketplace viability of CCS technology, and in turn overall investment in and development of CCS. Leakage also has a tremendous effect on public perception, and ultimately in the development of CCS-enabling policies and regulations, and overall acceptance of CCS as a politically viable mitigation option.

Previous work has demonstrated that carbonic acid, formed when carbon dioxide mixes with brines in storage formations, corrodes well-bore cement [1]. Simulations of this type of cement corrosion have matched well with experimental results [2], but better data for the transport properties of corroded well cement and its by-products are needed. Materials characterization can provide essential data for the porosity, permeability, mineral speciation, and mechanical properties of degraded cement materials. We will show how such data can be incorporated into models to predict the risk of leakage of geosequestered CO_2 from a depleted hydrocarbon reservoir.

[1] Duguid, A. *The Effect of Carbonic Acid on Well Cement.* PhD Thesis, Princeton University (2006).

[2] Huet, B., J.-H. Prevost, G.W. Scherer. *History matching of cement reactivity in CO2 saturated brine using the reactive transport code DYNAFLOW*. Journal of Geophysical Research (*In Press)*.