Rock-Fluid Chemical Interactions: the Influence of Ion Type and Ionic Strengths at Reservoir Conditions

Benaiah Anabaraonye [S], Cheng Peng, John H. Crawshaw and Martin J.P. Trusler [C]
Qatar Carbonates and Carbon Storage Research Centre, Department of Chemical Engineering, Imperial College London, London, United Kingdom
m.trusler@imperial.ac.uk

Following carbon dioxide injection in deep saline aquifers, CO_2 dissolves in the formation brines forming acidic solutions that can subsequently react with host reservoir minerals, altering both porosity and permeability. The direction and rates of these reactions are influenced by several factors including properties that are associated with the brine system. Consequently, understanding and quantifying the impacts of the chemical and physical properties of the reacting fluids and their effect on overall reaction kinetics is fundamental to predicting the properties of the injected CO_2. In this work, we present a thorough experimental study of the properties of different brine systems by varying ionic strengths and ionic species. The impact of these variables on rock-fluid chemical reactions is examined. Using a rotating disk technique, we have investigated the chemical interactions between CO_2-saturated brines and carbonate minerals such as calcite and dolomite at pressures (up to 15MPa) and temperatures (up to 353K)- conditions pertinent to carbon storage. Kinetic parameters derived from the study are subsequently applied to our previously derived computer model.