**Improving Control of Microbial Activity and Microbially-Induced Mineral Precipitation   
in Flow Systems - Experiments and Modelling**

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Batch and flow experiments at atmospheric and geologic CO2 storage-relevant pressures in our laboratories have demonstrated the ability of microbial biofilms and biofilm produced calcium carbonate precipitates to decrease the permeability of natural and artificial porous media as well as co-precipitate groundwater contaminants such as strontium.

Two overarching challenges in effectively implementing microbially induced calcium carbonate precipitation (MICP) are controlling (1) the spatial and temporal distribution of the formed precipitates and (2) the inactivation of microbes during the calcium carbonate precipitation process. Failure to control either one of those could result in injection well plugging or the necessity to implement costly cell-reinjection or -resuscitation strategies.

Our recent work has focused on optimizing strategies for MICP in small (capillaries and micromodels), meso (2 ft columns and 4 cm x 8 cm 2-d reactors) and large scale (75 cm diameter, 38 cm high sandstone radial flow) systems.

Results of these experiments have been modelled using two different approaches. (1) a microscale phase-field approach and (2) a large scale volume averaging approach. Close interaction between experimenters and modellers have resulted in improved injection strategies and the models are currently being used as experimental design tools.

This invited presentation will summarize our efforts over the past few years.