Geophysical Research Abstracts
Vol. 16, EGU2014-13620-1, 2014
EGU General Assembly 2014


# Pore scale investigation of textural effects on salt precipitation dynamics and patterns in drying porous media

Mansoureh Norouzi Rad (1) and Nima Shokri (2)

(1) School of Chemical Engineering and Analytical Sciences, University of Manchester, Manchester, United Kingdom (mansoureh.rad@postgrad.manchester.ac.uk), (2) School of Chemical Engineering and Analytical Sciences, University of Manchester, Manchester, United Kingdom (nima.shokri@manchester.ac.uk)

During stage-1 evaporation from saline porous media, the capillary-induced liquid flow from the interior to the surface of porous media supplies the evaporative demand and transfers the dissolved salt toward the surface where evaporation occurs. This mode of mass transfer is influenced by several factors such as properties of the evaporating fluid and transport properties of porous media. In this work, we carried out a comprehensive pore scale study using X-ray micro-tomography to understand the effects of the texture on the dynamics of salt precipitation and deposition patterns in drying saline porous media. To do so, four different samples of quartz sand with different particle size distributions were used enabling us to constrain the effects of particle size on the salt precipitation patterns and dynamics. The packed beds were saturated with NaCl solution of 3 Molal and the X-ray imaging was continued for 22 hours with temporal resolution of 30 min resulting in pore scale information about the evaporation and precipitation dynamics. During evaporation from saline porous media, salt concentration continuously increases in preferential evaporating sites at the surface until it reaches the solubility limit which is followed by salt precipitation. Thanking to the pore-scale information, the effects of pore size distribution on the dynamics and patterns of salt precipitation were delineated with high spatial and temporal resolutions. Our results show more precipitation at the early stage of the evaporation in the case of sand with the larger particle size due to the presence of a fewer evaporation sites at the surface. Having more preferential evaporation sites at the surface of sand with finer particle sizes affects the patterns and thickness of the salt crust deposited on the surface such that a thinner salt crust was formed in the case of sand with smaller particle size which covered a larger area at the surface as opposed to the thicker patchy crusts in samples with larger particle sizes. Our results provide new insights regarding the physics of salt precipitation and its complex dynamics in porous media during evaporation.