Lawrence Berkeley National Laboratory
Recent Work

Title
Synchrotron X-ray Tomography as Input for Multiphase Flow Modeling

Permalink
https://escholarship.org/uc/item/41v7k5mc

Authors
Ajo-Franklin, Jonathan
Benson, Sally
Kneafsy, Timothy
et al.

Publication Date
2010-08-25
Synchrotron X-ray Tomography as Input for Multiphase Flow Modeling*

Jonathan B. Ajo-Franklin, Sally M. Benson, Timothy J. Kneafsy, Alastair McDowell, Peter S. Nico, Dimtriy B. Silin, Liviu Tomutsa (Berkeley Lab, CA)

We have been using the tomographic capabilities of beamline 8.3.2 of the Advanced Light Source at Lawrence Berkeley National Lab to image a variety of geologic materials. Beamline 8.3.2 is a dedicated X-tomography beamline with a superbend magnet source that provides a monochromatic beam in the 5 to 60 keV range and a spatial resolution of ~2 microns. ([http://www-esg.lbl.gov/Beamline%20Scientific%20Projects/BL832/3-Link/bl832.htm](http://www-esg.lbl.gov/Beamline%20Scientific%20Projects/BL832/3-Link/bl832.htm)). Data provided by the beamline are processed and segmented in order to provide input for a variety of multiphase flow modeling applications. Example applications include understanding the displacement of brine by supercritical CO$_2$ in Frio sandstone and movement of natural gas within a low-permeability tight-sand gas reservoir. The CO$_2$ investigation combined the micro-tomography images with a novel computational approach of Maximum Inscribed Spheres (MIS) in order analyze the pore geometry and connectivity within the Frio sandstone. The combination of the micro-tomography and MIS calculation allowed for the simulation of CO$_2$ movement under a variety of injection scenarios. The tight-sand gas reservoir simulation used a similar approach to understand the link between pore space geometry and flow in such conventional reservoirs.

*This work was supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.