Petrophysical Evaluation of Carbonates from the Weyburn Oil Field using Synchrotron X-ray Computed Microtomography (CMT)

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Abstract
Synchrotron X-ray Computed Microtomography (CMT) is a powerful imaging technique that utilizes coherent and brilliant synchrotron light to produce high-resolution, three-dimensional images based on differences in X-ray attenuation within a sample. CMT is a rapid, non-destructive technique that allows 3D, in-situ imaging of a sample at micron-scale resolution. CMT was performed on Mississippian limestone and dolostone samples obtained from the Weyburn Reservoir, the site of EnCana Corporation's CO_2-miscible Enhanced Oil Recovery (EOR) project. This study is assessing the potential for CMT analysis to delineate petrophysical properties such as porosity, permeability and density-related differences in mineralogy with in rock cores. Comparisons of data obtained by CMT vs. electron backscatter using SEM are improving the understanding of the relationship between the Linear Attenuation Coefficient (LAC), phase density and mineral identification. Additionally, parameters determined by CMT will be compared with petrophysical measurements performed conventionally (permeameter, Hg porosimetry) on identical sections of Weyburn core. These measurements are required to investigate the pore-body and pore-throat volume distribution in the Marly and Vuggy units of the Weyburn reservoir and to elucidate controls influencing fluid transport at the pore-scale in the subsurface.