

EFFECTS OF MINERAL TRANSFORMATION ON POROSITY AND PERMEABILITY OF DOLOMITE DURING IN SITU RECOVERY OF BITUMEN

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Dolomites from the Upper Devonian Grosmont Formation in northeastern Alberta were tested by static and dynamic hydrothermal treatment at 200° and 265°C to determine the effect of mineral transformation on porosity and permeability. Static autoclaves and a high pressure flow system were utilized. Scanning electron microscopy, x-ray diffraction and chemical analysis of production fluids were employed to identify the important variables affecting the hydrothermal alteration using a factorial experimental design. During static hydrothermal treatment the porosity increased and there were indications that permeability decreased. In the dynamic experiments the permeability decreased although the porosity did not change significantly. Mineral transformation reactions and particle movement caused formation damage in both groups of experiments. Dolomite partly decomposed into calcite and huntite. Relative abundances of quartz, illite and kaolinite had decreased after treatment. All of the products of mineral reactions can migrate through the core and result in formation change. Dynamic treatment increases the mineral reaction rates and results in more extensive damage than does equivalent treatment in a static system.