Geophysical Research Abstracts
Vol. 13, EGU2011-5752, 2011
EGU General Assembly 2011

Investigation of Calcite precipitation in geothermal reservoir

Giordano Montegrossi
Italy (montegrossi@igg.cnr.it)

Rock-fluid interaction studies suggest that mineral dissolution and precipitation effects could have a major impact on the long-term performance of geothermal well. Since it is common to have geothermal well drilled in carbonate formations, or formations with significant carbonate contents, the precipitation and dissolution of calcite in geothermal reservoir has been here investigated. Calcite relates to the carbon dioxide behavior, as governed by boiling, dilution and condensation processes (Simmons and Christenson, 1994).
Calcite dissolution gradually decreases along the flow path from the recharge inflow of fresh water toward the extraction well, whereas a depositing phase may occurs in the neighborhood or within the extraction well. The deposition of calcite is mainly related to two effects: a) evaporation of the brine, which leads to calcite precipitation due to the consequent increase of calcium and carbonate concentrations, and b) forced CO2 ex-solution, which leads to an increase of the saturation index of calcite.
We considered sealing processes in low-permeability infinite reservoir, containing salty water, where vaporization of the solution occurs whithin the well because of vapor extraction at constant pressure.
The calcite sealing mechanism were studied by several authors, increasing the complexity of the sealing model.
The first approach is a stationary equilibrium model (e.g. Moller et al., 1998) were sealing is obtained by defining the CO2 breakout point; a further improvement is reactive transport modeling (Xu T. et al., 2004), that was used to simulate fluid production from a well located at the center of a 2D radial carbonate reservoir and calcite deposition/dissolution processes.
In this study is presented a reactive transport model that take into account the kinetic of dissolution/precipitation of carbonates, in a 2D radial carbonate reservoir with a shape investigation of calcite scaling at the bottom of a borehole with constant extraction pressure, by means of TOUGHREACT software package.
Increasing the model complexity require a more complete thermodynamic dataset and a more deep knowledge of the reservoir conditions, and in this study an ideal case is presented with realistic hypothesis.