



IMAGE Project: Results of Laboratory Tests on Tracers for Supercritical Conditions.

Øyvind Brandvoll (1), Sissel Opsahl Viig (1), Isabella Nardini (2), and Jiri Muller (1)

(1) Institute for Energy Technology (IFE), Kjeller, Norway , (2) CNR - Institute for Geosciences and Earth Resources, Pisa, Italy (nardini@igg.cnr.it)

The use of tracers is a well-established technique for monitoring dynamic behaviour of water and gas through a reservoir. In geothermal reservoirs special challenges are encountered due to high temperatures and pressures. In this work, tracer candidates for monitoring water at supercritical conditions (temperature $> 374^{\circ}\text{C}$, pressure ca 218 bar), are tested in laboratory experiments.

Testing of tracers at supercritical water conditions requires experimental set-ups which tolerate harsh conditions with respect to high temperature and pressure. In addition stringent HES (health, environment and safety) factors have to be taken into consideration when designing and performing the experiments. The setup constructed in this project consists of a pressure vessel, high pressure pump, instrumentation for pressure and temperature control and instrumentation required for accurate sampling of tracers. In order to achieve accurate results, a special focus has been paid to the development of the tracer sampling technique.

Perfluorinated cyclic hydrocarbons (PFCs) have been selected as tracer candidates. This group of compounds is today commonly used as gas tracers in oil reservoirs. According to the literature they are stable at temperatures up to 400°C . To start with, five PFCs have been tested for thermal stability in static experiments at 375°C and 108 bar in the experimental setup described above. The tracer candidates will be further tested for several months at the relevant conditions.

Preliminary results indicate that some of the PFC compounds show stability after three months. However, in order to arrive at conclusive results, the experiments have to be repeated over a longer period and paying special attention to more accurate sampling procedures.