



Scalings at geothermal facilities- Characterisation, processes and mass balance

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Scalings are a widespread problem among geothermal plants which exploit the Malm Aquifer in the Bavarian Molasse Zone. They effect the technical and economic efficiency of geothermal plants.

The majority of the scalings observed at geothermal facilities exploring the Malm aquifer in the Bavarian Molasse Basin are carbonates. They are formed due to a disruption of the lime-carbonic-acid equilibrium during production caused by degassing of CO₂. These scalings are found in the production pipes, at the pumps and at filters and can nicely be described using existing hydrogeochemical models.

In order to mitigate those scalings, the process of scaling formation and the influencing factors have to be better understood. Therefore scalings of all sections of geothermal facilities have been taken. So far, the database consists of scaling samples from 12 geothermal pumps, 5,000 m production pipe (sample interval 10-12 m), 11 evaporator revisions, 2 injection pipes and numerous filter elements. The samples were analysed by SEM-EDX, XRD and Raman-spectroscopy and acid digestion to assess their chemical and mineralogical composition.

The scaling thickness distributions along the production pipes together with operational data allow an estimate of the average scaling rate for each depth, which is rising from bottom to top. The analysis of the crystal size and morphologies indicates different scaling processes along the production pipes.

To determine the composition and mass of the scalings at the groundlevel facilities of 3 geothermal plants water samples were taken during the groundlevel cleaning process. The cleaning was performed by pumping an inorganic acid through the groundlevel pipes.

The hydrochemical composition of the samples reflects the scaling composition. The mass balance showed that a total mass of 2.2 tons has accumulated in the groundlevel facilities.