PROCESS FOR CONTROLLED SCALE DEPOSITION FROM GEOTHERMAL BRINE

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Despite their virtually inexhaustible potential, geothermal energy resources have only reached a niche status in Germany up to now. Among the reasons for this are the high risks involved in the search for suitable geological structures at great depths and the unresolved technical problems in application due to scaling and corrosion.

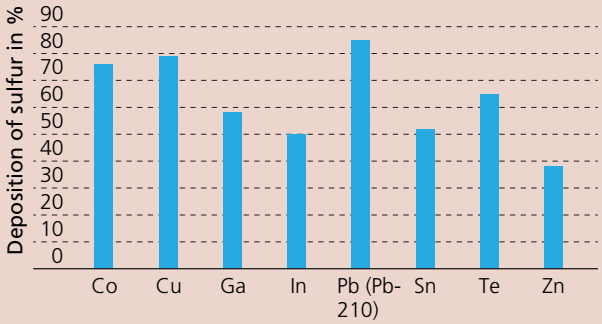
Scaling describes the deposition of mineral and metal incrustations on material surfaces to the detriment of plant economics and safety. Geothermal water and brine extracted from great depths often contain a wide range of naturally occurring chemical elements. Of these, the toxic heavy metals and metalloids As, Pb, Cd, and Tl as well as the naturally occurring radioactive isotopes and chemical elements Pb-210, Po-210, and radium isotopes are considered to be especially critical. Both the handling of these substances and the disposal of residues containing them are extremely problematic. On the other hand, water occurring at such great depths can have relatively high contents of rare and strategic metals in easily recoverable form. For a large number of these chemical elements, electrochemical deposition is possible even under the conditions (e.g., high temperatures and pressures) prevailing in geothermal systems.

In light of this, a process and a prototype setup (Figure 1) for in-situ electrochemical deposition of undesired substances were developed and field-tested within the framework of a project (FKZ 0325696) funded by BMWi (German Federal Ministry for Economic Affairs and Energy). Initial test results under conditions of practice showed that the metals could be deposited in the form of compact metal foils (Figure 2). High amounts of lead, thallium, and arsenic as well as polonium-210 and radium isotopes were accumulated. Use of a porous, or packed-bed, cathode in a flow-through reactor with separate anode and cathode chambers was found to be especially effective, allowing for separation of more than 90 % of the scale- forming substances present in the geothermal water.

Investigations on a geothermal brine from the research borehole at Groß Schönebeck revealed the potential for recovery of a series of rare metals, including gallium, indium, tellurium, copper as well as other metals.

A patent application for the process and the setup has been filed.

Deposition of rare metals and strategic metals from geothermal brines



1 *Electrodeposition unit in installed condition.*

2 *Controlled in-situ deposition of scales containing Pb, As and/or Tl.*

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