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Copper corrosion monitoring by electrical resistance probes in anoxic groundwater environment in the presence and absence of sulfate reducing bacteria

Maija Marja-aho^{1,*}, Pauliina Rajala¹, Elina Huttunen-Saarivirta¹, Andraž Legat², Andrej Kranjc², Tadeja Kosec², Leena Carpén¹

¹VTT Technical Research Centre of Finland Ltd, Kemistintie 3, 02044 VTT, Finland

²ZAG Slovenian National Building and Civil Engineering Institute, Dimičeva ulica 12, SI 1000 Ljubljana, Slovenia

*Corresponding author: telephone no +358401475951

Email: maija.marja-aho@vtt.fi, maija.marjaaho@gmail.com

Highlights

- Corrosion of copper in groundwater was studied with ER probes and parallel methods
- Sensitivity of the different methods (ER, LPR and weight loss) vary considerably
- ER probes gave the most conservative estimation of the lifetime of copper
- The trend of the corrosion rates measured with parallel methods was similar

Abstract

In this study the results from corrosion monitoring of copper in anoxic simulated ground water in the presence and absence of sulfate-reducing bacteria (SRB) enriched from the planned disposal site of high level nuclear waste are presented. Copper electric resistance (ER) probes were applied as a physical tool for monitoring corrosion of copper disposal canister. The results are compared to those obtained by linear polarization resistance (LPR) measurements, conducted for parallel OFP-Cu specimens during the experiments, and by weight loss measurements. ER probe method was the most sensitive to corrosion and gave the most conservative estimation of the lifetime of copper. Independently whether the environment was abiotic or biotic, ER probe data showed relatively similar trends to the results from LPR and weight loss measurements. Difference in sensitivity of the methods arises from different ability to detect pitting corrosion and microbial activities on specimen surfaces in the two environments.

Keywords:

Corrosion monitoring

Copper

Microbiologically influenced corrosion

Groundwater

Nuclear waste disposal

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