

Comments regarding the BRITE report 2008-1, “A Review of Evidence for Corrosion of Copper by Water”

The BRITE-group (Barrier Review, Integration, Tracking and Evaluation) has made a review of corrosion of copper by water on the request by the Swedish Nuclear Power Inspectorate, SKI (at present SSM). We, Peter Szakálos and Gunnar Hultquist, were invited by SKI to a meeting with the BRITE-group 2008-05-12 to have a presentation/answering regarding our research on copper corrosion by water. We had put considerable efforts in our presentation and supported the group with both published and unpublished material. Furthermore, we have answered all their questions during the meeting and in a subsequent e-mail correspondence with Timo Saario from VTT in Finland. Surprisingly, the review report, which was mainly written by Timo Saario, was limited to only one of our publications, Ref. [1] and not considering the information given at the meeting 2008-05-12 or in our subsequent e-mail communication.

Without going into scientific details, we have noticed that the attempt by Timo Saario to *calculate* the corrosion rate based on Ref. [1] is unfortunately wrong with a factor of 10 000, which we have already pointed out to him. The true *measured* local copper corrosion rate in anoxic water is in fact 5 $\mu\text{m}/\text{y}$ already at room temperature, see Ref. [2].

Additionally, we want to point out the following regarding the review:

- Timo Saario has not suggested any hypothesis, concerning the source for hydrogen evolution that we have already excluded.
- We have positively noticed that the alternative hypothesis for hydrogen evolution published by Professor Lars Gunnar Johansson at CTH, Ref. [3], has been ruled out and considered as negligible in the BRITE-report.

As we have already pointed out to the BRITE-group, most essential for the future and for the verification of the KBS-3 model are:

1. The urgent need for knowledge of hydrogen uptake in the copper metal due to corrosion and its consequences for the mechanical properties, see also Ref. [2].
2. Copper corrosion by water is very temperature sensitive and there is a surprisingly large lack of knowledge regarding copper corrosion, especially in hot water, despite the fact that the KBS-3 model implies thousands of years of copper exposure to water at elevated temperatures.

We would naturally welcome a general review of copper corrosion by water which should include work done 20 years ago and the accepted paper which is attached here, Ref. [2].

References:

- [1] P. Szakálos, G. Hultquist and G. Wikmark, *Electrochem. Solid-State Lett.*, 10 (11) C63-C67, 2007.
- [2] G. Hultquist, P. Szakálos, M. J. Graham, G. I. Sproule and G. Wikmark, Paper accepted for publication by the International Corrosion Congress (ICC 2008), see attached file.
- [3] L-G Johansson, *Electrochem. Solid-State Lett.*, 11 (4) S1-S1, 2008

Stockholm, September 2008

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