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Scientific Consulting

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4 May 1988
88.rbm.44

Mr. K. C. Chang
Mail Stop WF1-4H3
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Kien:

Services Rendered on High Level Waste Repository
Performance Assessment Development 4/9/88-4/30/88

In the attached report I have provided an essentially complete exposition of the theory of intergranular stress corrosion cracking. Included are all the experimental data and their uncertainties that are needed to calculate the probability density function (pdf) for the time to failure of a stainless steel container that has been subjected to the heating effects of welding or other process in which incomplete annealing has occurred.

The various analyses that I have carried out have demonstrated that the major source of uncertainty in the prediction of the time to failure of a stainless steel container by this mechanism is directly attributable to the uncertainty in the value of the diffusion coefficient of chromium. This large uncertainty can be remedied by carrying out the appropriate experimental. The most recent such measurements were made more than 10 years ago.

This result is a very strong vindication of NRC's desire to use the modeling of the reliability of the EBS to help guide and direct experimental studies to those areas that will have the most impact on the assessment of the reliability of the repository.

A second notable result is the reduction in the number of calculations needed to estimate the chromium activity coefficient that results from the procedure used to develop a description of the activity coefficient of chromium. In essence, this procedure replaces the complex calculations by a simple response function. Without this procedure, the complexity of the required calculation is quite large.

Dr. Boyars provided a substantial amount of help in making these results possible, not only by locating and copying the many documents, but also by reviewing many other documents and

pointing out their relevancy (or lack of it) and by spending many hours discussing various technical issues and helping to overcome numerous difficult points of understanding both in experiment and in theory.

I expect to spend the next few weeks concentrating in two areas; reviewing available studies on the corrosion of copper and studying the dissolution kinetics of glass waste forms. In the latter case I have a preliminary model already developed which I believe can be validly modified to include some recent data from the tuff project.

Other Matters

I am enclosing three (3) copies of the Voucher for Professional Services for your approval.

As of 1 May I have charged 109 days of the 130 days authorized.

If you have any questions, please feel free to call me.

Sincerely,

Robert B Moler

Robert B. Moler

enc: report
vouchers