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June 14, 2002
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U.S. Nuclear Regulatory Commission
ATTN: Mrs. Deborah A. DeMarco
Two White Flint North
11545 Rockville Pike
Mail Stop T8 A23
Washington, DC 20555

Subject: Submittal of abstracts for the 2002 MRS Fall Meeting—The 26th International Symposium on the Scientific Basis for Nuclear Waste Management in Boston, MA on December 2–6, 2002

Dear Mrs. DeMarco:

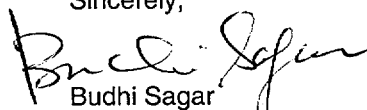
Enclosed are the following three abstracts with A390 forms that will be submitted the organizers of the MRS meeting on June 19, 2002.

- (1) Long-Term Extrapolation of Passive Behavior of Alloy 22 authored by O. Pensado, D.S. Dunn, G. Cragnolino, and V. Jain
- (2) Corrosion and Stress Corrosion Cracking of Alloy 22 in Lead-Containing Solutions authored by Y.-M. Pan, D.S. Dunn, L. Yang, and G. Cragnolino
- (3) Corrosion Behavior of Carbon Steel Materials under Salt Deposits and Simulated Dry Repository Environments authored by L. Yang, R. Pabalan, L. Browning and D.S. Dunn

These abstracts are being submitted to the MRS meeting organizers and NRC in parallel to meet the MRS meeting submission date of June 19, 2002. The abstracts will be withdrawn from further consideration by the meeting organizers if NRC staff review indicates that the abstracts are programmatically unacceptable. Also, note that the paper by L. Yang, et al. has evolved as a collaborative effort between CLST and FNFE KTI and provides important insights into the effects of deliquescence behavior on the corrosion of carbon steel.

Please contact Vijay Jain at (210) 522-5439 if you have any questions regarding these abstracts. Please advise me of the results of your programmatic review. Your cooperation in this matter is appreciated.

Sincerely,


Budhi Sagar
Technical Director

cc:	J. Linehan	K. Stablein	T. Ahn	A. Henry	G. Cragnolino	O. Pensado
	B. Meehan	B. Leslie	T. Bloomer	J. Schlueter	D. Dunn	R. Pabalan
	E. Whitt	S. Wastler	J. Andersen	A. Campbell	S. Brossia	L. Browning
	W. Reamer	D. Brooks	J. Thomas	W. Patrick	Y.-M. Pan	P. Maldonado
	J. Greeves	T. McCartin	T. Essig	CNWRA Dirs & EMs	L. Yang	T. Nagy (contracts)



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LONG-TERM EXTRAPOLATION OF PASSIVE BEHAVIOR OF ALLOY 22

Osvaldo Pensado, Darrell Dunn, Gustavo Cragolino, and Vijay Jain
Center for Nuclear Waste Regulatory Analyses (CNWRA), San Antonio TX, USA

Common hypotheses to predict the lifetime of proposed high-level waste disposal containers made of Ni-Cr-Mo alloys, in the absence of environmental and electrochemical conditions leading to localized corrosion and stress corrosion cracking, are evaluated based on a model for passive dissolution. The predominant charge conduction mechanism through the oxide film formed on Ni-Cr-Mo alloys is interstitial transport of metal cations. Dissolution of the alloy, in the form of interstitials through the film, causes the creation of vacancies in the alloy. The anodic current density, under potentiostatic condition, decreases as a function of time, and two-week transients in the current density are rationalized on the basis of vacancy accumulation at the metal-oxide interface. It is concluded that the dissolution process is regulated by vacancy-enhanced diffusion of the elements in the alloy. Long-term stoichiometric dissolution arises if the diffusion coefficients of the alloy elements are similar. Potential consequences of the proposed dissolution mechanism are discussed in the context of the long-term extrapolation of the passive behavior of Ni-Cr-Mo alloys.

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Long-Term Extrapolation of Passive Behavior of Alloy 22

2. AUTHOR(s)

O. Pensado, D. Dunn, G. Cragolino, and V. Jain

3. NAME OF CONFERENCE, LOCATION, AND DATE(s)

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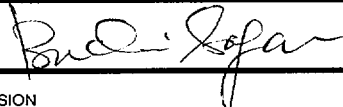
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MRS 2002 Fall Meeting

The 26th International Symposium on the Scientific Basis for Nuclear Waste Management

December 2-6, 2002

Boston, Massachusetts

CORROSION AND STRESS CORROSION CRACKING OF ALLOY 22 IN LEAD-CONTAINING SOLUTIONS

Y.-M. Pan, D.S. Dunn, L. Yang, and G.A. Cragolino

Center for Nuclear Waste Regulatory Analyses

Southwest Research Institute

6220 Culebra Road, San Antonio, TX 78238-5166

ABSTRACT

The susceptibility of Alloy 22 to localized corrosion and stress corrosion cracking (SCC) was evaluated in lead-containing solutions. Lead speciation calculations indicate that dissolution of lead salts resulted in the formation of Pb^{2+} and Pb-Cl complexes. $PbCl_2$ was selected among several lead compounds for its high solubility and dissolution rate, and solution composition as total lead ions concentration was measured by inductively coupled plasma-atomic emission spectrometry. Comparative anodic polarization tests were conducted in a range of $PbCl_2$ solutions by adjusting the solution pH. An anodic peak was observed in potentiodynamic polarization curves of Alloy 22, suggesting the possible susceptibility to localized corrosion and SCC in the presence of lead species. In SCC tests using U-bend specimens, Alloy 22 was found to be resistant to SCC when tested in supersaturated $PbCl_2$ solution (pH 0.5) at 95°C [203°F] at a potential near the anodic peak. No SCC was detected on Alloy 22 specimens after a total test duration of 840 hours; however, localized corrosion in the form of shallow pits was observed on the legs of the U-bend specimens above the solution level.

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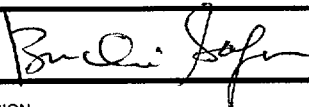
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December 1–5, 2002
Boston, Massachusetts

CORROSION BEHAVIOR OF CARBON STEEL MATERIALS UNDER SALT DEPOSITS IN SIMULATED DRY REPOSITORY ENVIRONMENTS

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Abstract

Carbon steels will be used as emplacement drift ground support materials in the proposed Yucca Mountain high-level waste repository. Because of the heat generated by the radioactive wastes, the drift would go through a hot and dry period. During this period, corrosive salts and brines may deposit on the surface of the carbon steel materials due to evaporation of groundwater seeping into the repository drift. Corrosion measurements were conducted using coupled multi-electrode sensors to study the corrosion behavior of carbon steel materials under salt deposits in simulated drift environments. In experiments with pure NaCl and KCl, it was observed that, once initiated, the under deposit corrosion cannot be stopped by lowering the relative humidity to values that are well below the deliquescence relative humidity of the NaCl or KCl salt. Significant corrosion was observed at relative humidities down to 40 percent. The experimental measurements also show that as corrosion occurs, the deliquescence relative humidity of the salt deposits decreases. This phenomena is attributed to the effect of corrosion products that form a mixed salt deposit and lower the deliquescence relative humidity. The deliquescence relative humidities of FeCl_2 and FeCl_3 also were measured and compared with the deliquescence relative humidity of the salt mixtures formed during the corrosion measurement.

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L. Yang, R. Pabalan, L. Browning, and D.S. Dunn

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