HLWYM HEmails

From: Vijay Jain [vjain@cnwra.swri.edu]
Sent: Thursday, April 06, 2006 9:05 AM
To: Tae Ahn; David Pickett; Keith Compton; Richard Codell; Timothy McCartin; VJAIN.CNWRA.Internet@nrc.gov
Cc: 'Albert Wong'; 'Marissa Bailey'; 'Mahendra Shah'
Subject: RE: New TAD Table
Attachments: Corrosion values.wpd

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I am also including a corrosion rate table that could be useful in our discussion.
Vijay

Vijay Jain
Corrosion Science and Process Engineering Center for Nuclear Waste Regulatory Analyses Southwest Research Institute 6220 Culebra Road San Antonio, TX 78228
V: (210) 522 5439
F: (210) 522 6081
http://www.swri.org/4org/d20/ebs/home.htm

-----Original Message-----
From: Tae Ahn [mailto:TMA@nrc.gov]
Sent: Thursday, April 06, 2006 7:37 AM
To: dpickett@cnwra.swri.edu; Keith Compton; Richard Codell; Timothy McCartin; VJAIN.CNWRA.Internet@nrc.gov
Cc: Albert Wong; Marissa Bailey; Mahendra Shah
Subject: RE: New TAD Table

For discussion today based on TBD7 (REV 1), CSNF Abstraction and CNWRA 2002-01,

(1) The slight pH changes in the alkaline regime do not seem to affect the SNF degradation Rate. Among three regression in CSNF Abstraction, only one shows weak dependence. In the acidic model of TPA, we may change lower end pH above 4.5 in TPA, which could lower the SNF degradation rate.

(2) What would be the basis of unlikely low pH (up to 600 years) in DOE's batch model? Do we need to keep the lower bound of pH 4.5 in TPA?

(3) Carbon steel could offer oxygen consumption, which may alter SNF degradation, solubility and colloid formation.

(4) Boral (Aluminum) as included by Tim was not addressed. It would be similar to Neutronit, pH 6 - 7 and faster corrosion (TBD7)

Others such as colloids seem to be consistent with the previous tables, as we discussed on the line. I think we need to consider and discuss whether these internals affect TSPA/TPA substantially - so far doesn't seem to. I thought, though based on TBD7 and CNWRA 2002-01, carbon steel could be beneficial - sorption, buffering pH, and lowering oxygen

Tae

>>> David Pickett <dpickett@cnwra.swri.edu> 04/05/06 9:01 PM >>>

Attached is my edit of a table provided by Vijay. I hope it is useful.
It includes my musings on chemical effects of components and my collection of Np and Pu concentration info.
For the Pu, what's missing is key: what do we think will be the concentration of Pu associated with iron corrosion product colloids? I had earlier provided Tae with a set of numbers from our TPA abstraction, but these were from an untested implementation and represented a single realization. And it is difficult (though maybe not impossible) to figure out what DOE's abstraction would yield.

You'll note there's no distinction in my notes between Neutronit and NiGd. Their chemical effects are essentially similar.

David

> -----Original Message-----
> From: Timothy McCartin [mailto:TJM3@nrc.gov]
> Sent: Friday, March 24, 2006 2:58 PM
> To: bsagar@cnwra.swri.edu; dpickett@cnwra.swri.edu;
> rpabalan@cnwra.swri.edu; vjain@cnwra.swri.edu; ypan@cnwra.swri.edu;
> Andy Campbell; Albert Wong; Christopher Grossman; James Rubenstone;
> Keith Compton; Marissa Bailey; Mahendra Shah; Richard Codell; Tae Ahn
> Subject: New TAD Table
>
>
> All:
>
> Based on the discussions today - attached is a revised table that
> inputs will be filled out, as best they can, by Tae, Keith and Vijay
> for our next meeting. Please feel free to comment on the Table prior
> to our next meeting.
>
> Thanks, Tim
>
>

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From: Vijay Jain

Created By: vjain@cnwra.swri.edu

Recipients:
"'Albert Wong'" <AXW2.TWGWPO02.HQGWDO01@nrc.gov>
Tracking Status: None
"'Marissa Bailey'" <MGB.OWGWPO01.HQGWDO01@nrc.gov>
Tracking Status: None
"'Mahendra Shah'" <MJS3.TWGWPO02.HQGWDO01@nrc.gov>
Tracking Status: None
"Tae Ahn" <Tae.Ahn@nrc.gov>
Tracking Status: None
"David Pickett" <dpickett@cnwra.swri.edu>
Tracking Status: None
"Keith Compton" <Keith.Compton@nrc.gov>
Tracking Status: None
"Richard Codell" <Richard.Codell@nrc.gov>
Tracking Status: None
"Timothy McCartin" <Timothy.McCartin@nrc.gov>
Tracking Status: None
"VJAIN.CNWRA.Internet@nrc.gov" <VJAIN.CNWRA.Internet@nrc.gov>
Tracking Status: None

Post Office: cnwra.swri.edu

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Corrosion values.wpd	8194	

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Table 1. Metals

	Surface Area [DOE] (m^2)	Corrosion Rate [DOE] (um/yr)	Remarks
Carbon Steel [A516]	180	72	Significantly lowers (orders of magnitude) dissolved U concentration in solution (Quinones et al, 2001). Not evident if reduced solubility is attributed to the presence of iron metal or reduced SNF dissolution rate. Increases colloid formation 700 times faster than stainless steel.
Stainless Steel [316]	180 [plus inner WP surface 24]	0.1	700 times lower corrosion rate compared to carbon steel. Generation rate of colloids would be slow compared to CS.
Neutronit	53	0.1	DOE study indicates high corrosion rates in YM waters.
NiGd Alloy	53	0.05	Preferred DOE Material for neutron absorber material
Aluminum 6061	26	3	Used as shunts. Corrosion effects on SNF not known.
SNF	462	variable	depends on pH and CO3 concentration

Table 2. Evolution of aqueous chemistry

Combination of WP internals	pH	Ionic Strength	Remarks
Carbon Steel [A516]/Stainless Steel/Neutronit (or NiGd alloy)	7-9.5	High pH could provide a larger source of U complexes. Increase pH	DOE simulations indicates pH reduces to 4 due to the sulfur in carbon steel. CNWRA experiments indicate ph rise to 9.5
Stainless steel/Neutronit	near-neutral		pH and ionic strength are expected to be lower than carbon steel combination.
Stainless steel/NiGd Alloy	near-neutral		pH and ionic strength are expected to be lower than carbon steel combination.

Aluminum 6061	near-neutral		Role of aluminum not known at this time.
SNF			