

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
ANALYSIS/MODEL COVER SHEET
Complete Only Applicable Items

1. QA: QA
Page: 1 of: 88

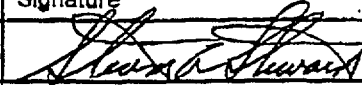
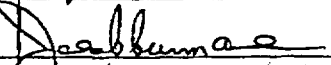
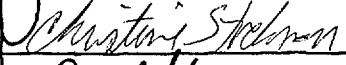

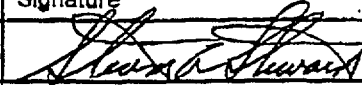
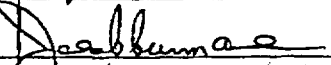
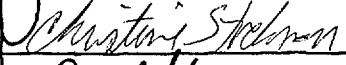

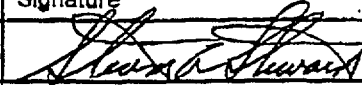
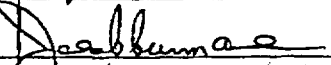
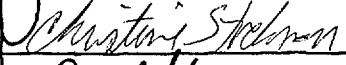

2. <input checked="" type="checkbox"/> Analysis <input type="checkbox"/> Engineering <input type="checkbox"/> Performance Assessment <input checked="" type="checkbox"/> Scientific	3. <input checked="" type="checkbox"/> Model <input checked="" type="checkbox"/> Conceptual Model Documentation <input checked="" type="checkbox"/> Model Documentation <input checked="" type="checkbox"/> Model Validation Documentation															
4. Title: CSNF Waste Form Degradation: Summary Abstraction																
5. Document Identifier (including Rev. No. and Change No., if applicable): ANL-EBS-MD-000015 REV 00																
6. Total Attachments: 1	7. Attachment Numbers - No. of Pages in Each: I. Document Input Reference Sheet (DIRS), 10 pages															
	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:30%;">Printed Name</th> <th style="width:30%;">Signature</th> <th style="width:40%;">Date</th> </tr> </thead> <tbody> <tr> <td>8. Originator: Steven A. Steward</td> <td></td> <td>Jan. 12, 2000</td> </tr> <tr> <td>9. Checker: James C. Cunnane</td> <td></td> <td>1/12/00</td> </tr> <tr> <td>10. Lead/Supervisor: Christine Stockman</td> <td></td> <td>1/12/2000</td> </tr> <tr> <td>11. Responsible Manager: David Stahl</td> <td></td> <td>1/12/00</td> </tr> </tbody> </table>	Printed Name	Signature	Date	8. Originator: Steven A. Steward		Jan. 12, 2000	9. Checker: James C. Cunnane		1/12/00	10. Lead/Supervisor: Christine Stockman		1/12/2000	11. Responsible Manager: David Stahl		1/12/00
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12. Remarks																

Table 18. Coefficients and Statistics for the Alkaline Spent-Fuel Dissolution Model in Table 17 with Temperature as the Only Variable

Term	Coefficient	Standard Error	T-value	Significance
1	3.824295	0.827990		
IT	-1046.960206	263.492557	-3.97	0.0002

NOTES: No. cases = 60
R-sq. = 0.2140
RMS Error = 0.465
Resid. DF = 58
R-sq-adj. = 0.2004

An alternate approach is one in which the unirradiated UO_2 and spent-fuel dissolution data are modeled separately not including cross-terms. Those fits are included in Tables 19 and 20. The UO_2 model has an R-squared of 0.8. The spent-fuel model in Table 20 has an R^2 of only 0.6.

Table 19. Coefficients and Statistics for the Alkaline UO_2 Dissolution Model

Term	Coefficient	Standard Error	T-value	Significance
1	5.612993	1.345481		
IT	-1821.008694	353.161180	-5.16	0.0001
PCO_3	-0.303113	0.089489	-3.39	0.0035
PO_2	-0.475644	0.093283	-5.10	0.0001
PH	0.241005	0.089458	2.69	0.0154

NOTES: No. cases = 22
R-sq. = 0.8089
RMS Error = 0.3541
Resid. DF = 17
R-sq-adj. = 0.7639

Table 20. Coefficients and Statistics for the Alkaline Spent-Fuel-Only Dissolution Model

Term	Coefficient	Standard Error	T-value	Significance
1	4.444920	0.878684		
IT	-702.182559	168.339695	-4.17	0.0002
PCO_3	-0.044638	0.043371	-1.03	0.3111
PO_2	-0.222600	0.049589	-4.49	0.0001
PH	-0.136076	0.047954	-2.84	0.0078
LBU	-0.096252	0.302149	-0.32	0.7521

NOTES: No. cases = 38
R-sq. = 0.6067
RMS Error = 0.2393
Resid. DF = 32
R-sq-adj. = 0.5452

Shoosmith (1999, Sec. 5.8) states that the corrosion of spent fuel is inherently the same process as that of unirradiated UO_2 . This viewpoint depends on the chemical environment as well as what is considered to be significantly different. Table 1 shows dissolution rate differences