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Elemental Iodine Retention on Nuclear Grade Carbons: Comparison of Impregnated and Non-Impregnated Carbons,

Peter Freeman, Jacobi Carbons

- Various versions of the elemental iodine retention test has been used over the years to satisfy the new carbon testing requirements for post accident ESF (Reg. Guide 1.52) adsorption units
- Starting with the RDT tests developed at Oak Ridge and tests developed at Savannah River during the 60's and 70's
- And leading up to the versions of D3803 starting in '79 and ending in '86

- That's right, since 1989 D3803 has not had a
an elemental retention iodine test!
- We now have a **DRAFT REGULATORY
GUIDE DG-1274** (*Proposed Revision 4 of
Regulatory Guide 1.52*)
- Whose iodine adsorption units “typically
consist of impregnated activated carbon and
are installed to remove gaseous radioactive
elemental and organic forms of iodine from
the air stream during DBAs “

- Each original or replacement batch or lot of impregnated activated carbon used in the adsorber section should meet Section FF-5000 of ASME AG-1-2009
- AG-1 requires a 180° elemental iodine retention test in accordance with D3803 with a 99.5% acceptance criterion as a batch test for new carbon
- Ostensibly, this test simulates the heating effects from adsorbed dose and shows that the radioiodine stays on the carbon

- The caveat added to D3803-89 and its editorial revisions is that if the test parameters are maintained to the tolerances of the low temperature test every thing should be fine
- The drinks are on me if any testing lab maintains the 180 °C temperature to ± 0.2 °C during the performance of this test!

- It has been kind of a tacit agreement that this is no big deal since “everyone knows” that even un-impregnated carbon will pass this test.
- And indeed A. G. Evans and Ron Bellamy (among others) have said this to be true in past presentations at this conference.

- To act as a “myth buster” three samples of plain activated carbon were tested according to ASTM D3803 -86 (the old method E test):
 - Loading of iodine for 10 minutes at 30°C
 - Followed by elution at 180°C for 240 minutes

- Results:

60 CTC 8 x 16 coconut shell activated carbon
99.91% retention

70 CTC 8 x 16 coconut shell activated carbon
99.91% retention

80 CTC 8 x 16 coconut shell activated carbon
99.85% retention

Lot 81203006 KI/TEDA impregnated 8 x 16
coconut shell activated carbon (60 CTC base)
99.99% retention

Tests performed by NCS and NUCON

- So, this begs questions which I would like you all to consider:
 - Why perform this test?
 - Or maybe we could use this test on plain carbon?
 - And use the plain carbon to trap elemental iodine and “protect” the more costly impregnated carbon used to trap methyl iodide? (guard bed concept)

Discussion and Questions?