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

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• Various versions of the elemental iodine retention test has been used over the years to satisfy the new carbon testing requirements for post incident 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 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 it’s editorial revisions is that if the test parameters are maintained to the tolerances of the low temperature test everything 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?