BNL ALARA Center Data Base

U.K. R-383

REVIEW OF EFFECT OF LITHIUM ON PWR FUEL CLADDING CORROSION

Keywords: COMPONENT RELIABILITY; FUEL CLADDING; ZIRCALOY; CORROSION; LITHIUM; WATER CHEMISTRY; PRIMARY COOLANT CHEMISTRY; OXIDE FILM; PWR

Principal Investigator:

M. Polley
Nuclear Electric
Berkeley Technology Centre
Berkeley, Gloucester GL13 9PB
U.K.
Phone: 44(UK)-453-812174

Project Manager:

Objectives: Review the reactor corrosion data on Zircaloy-4 which is currently available and to place this within the context of expectations derived from laboratory tests in an attempt to assess whether reactor corrosion rates are enhanced by operating an elevated-lithium regime.

Comments:

Laboratory Experience:

- Early isothermal tests showed that LiOH additions resulted in an increase in the rate of Zircaloy corrosion, especially in the post-transition region.
- Recent isothermal autoclave tests show that the deleterious influence of lithium additions is ameliorated even at quite low concentrations of boric acid.
- Tests done under boiling conditions indicate that realistic concentrations of boron can ameliorate the effects of high concentrations of lithium, even though boiling concentrates the lithium at the oxide surface

Experience From Reactors Operating Under Elevated-Lithium Regimes:

- Millstone Point 3: somewhat higher corrosion rates
- Ringhals: no significant enhancement in oxide thickness
- St. Lucie 1: seem to show a faster increase in corrosion rate
- Calvert Cliffs: no significant enhancement in corrosion rates
- The Halden In-Pile Loop: little effect on enhancing corrosion rates

Remarks/Potential for dose limitation: The reactor experience summarized show that NO gross deterioration in Zircaloy corrosion behaviour has been found from operation under elevated-lithium conditions. In cases where there seem to be lithium enhanced corrosion rates, more studies need to be done to ascertain whether the increased rates are due to high lithium concentration or some other cause.

References: Polley, M.V. and Evans, H.E., "Review of Effect of Lithium on PWR Fuel Cladding Corrosion," *Water Chemistry of Nuclear Reactor Systems 6*, Vol. 2, pp. 61-66, British Nuclear Energy Society, London, 1992.

Duration: from: 1991 to: 1992
Funding: N/A
Status: Completed
Last Update: September 15, 1993