

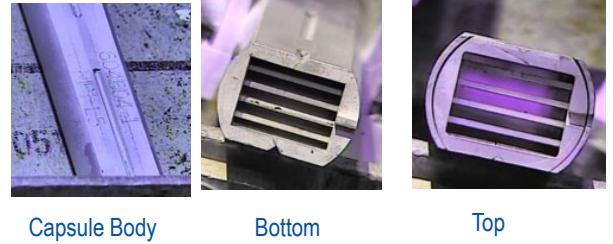
# USHPRR MP-1 Irradiation Test: Assessment of Edge Pitting and Bond Line Corrosion in Vendor Produced Fuel Plates

J. J. Giglio, J. F. Jue, M. P. Johnson, J.I. Cole  
Idaho National Laboratory, 1955 N. Fremont Ave, Idaho Falls, ID, USA

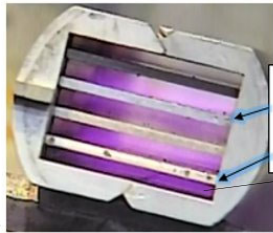
## Motivation/Project Objectives:

- Objective of MP-1 Experiment was to confirm suitable performance of monolithic fuel fabricated by vendor (62 plates) and assess performance against laboratory made fuel plates (12) at NRC reactor operating conditions
- During ATR Cycle 166a (43 days), an increase in activity was detected in ATR primary coolant system
  - Two laboratory (INL) fabricated fuel plates were identified as source of the fission products
  - Extensive PIE and out-of-pile investigations occurred to assess the cause of fuel breach and develop recovery path
  - In the investigation, corrosion was discovered in the vendor fabricated plates

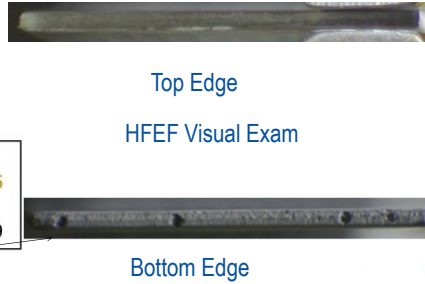
## In Canal Visuals:



## Results:

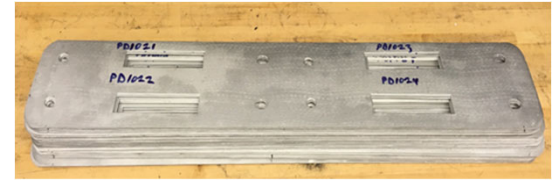


B5-DUM  
B6-A2B106  
B7-DUM  
B8-A2C169



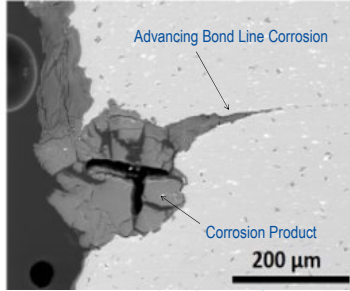
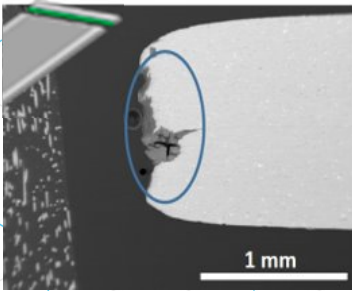
Top Edge  
HFEF Visual Exam

Bottom Edge

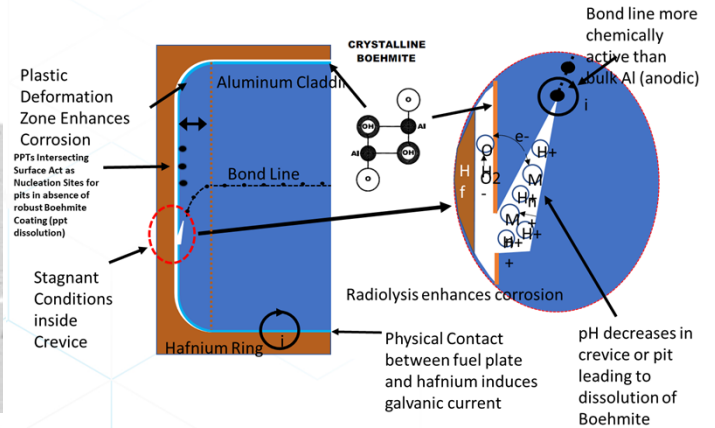


MP-1 Fuel Plate Punches

Edge of Fuel Plate



SEM Image from Destructive Exam of Low Power Fuel Plate



Possible Corrosion Mechanisms for Al-6061

## Conclusions:

- As a result of the investigation into Laboratory constructed fuel plates failure, corrosion issues were discovered in the vendor fabricated plates
- Punching of fuel plates left edge deformations on fuel plates
  - Tops of plates showed no corrosion as they were mechanically ground for size
  - Other edges were left as is
- All MP-2 Plates will have edges finished to minimize opportunity for corrosion to occur

## Acknowledgements:

Mr. Matt Hammond – USHPRR  
Ms. Margaret Marshall – MP-1 PI  
Dr. Vineet Joshi – Fuel Plate Punching Figure FF Pillar Team – Technical Discussions  
Dr. Fidelma Di Lemma – SEM Imaging  
Ms. Tammy Trowbridge – SEM Imaging  
HFEF Hot Cell Team – VEM Imaging  
Dr. W. Alex Hanson – VEM imaging

## Funding:

Supported by the U.S. Department of Energy, Office of Material Management and Minimization, National Nuclear Security Administration, under Contract DE-AC07-05ID14517