

NRC PWSCC Initiation Research

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EPRI Alloy 690/52/152 PWSCC Research
Collaboration Meeting

December 3-6, 2013

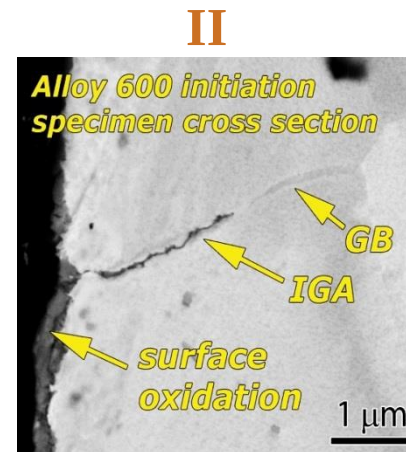
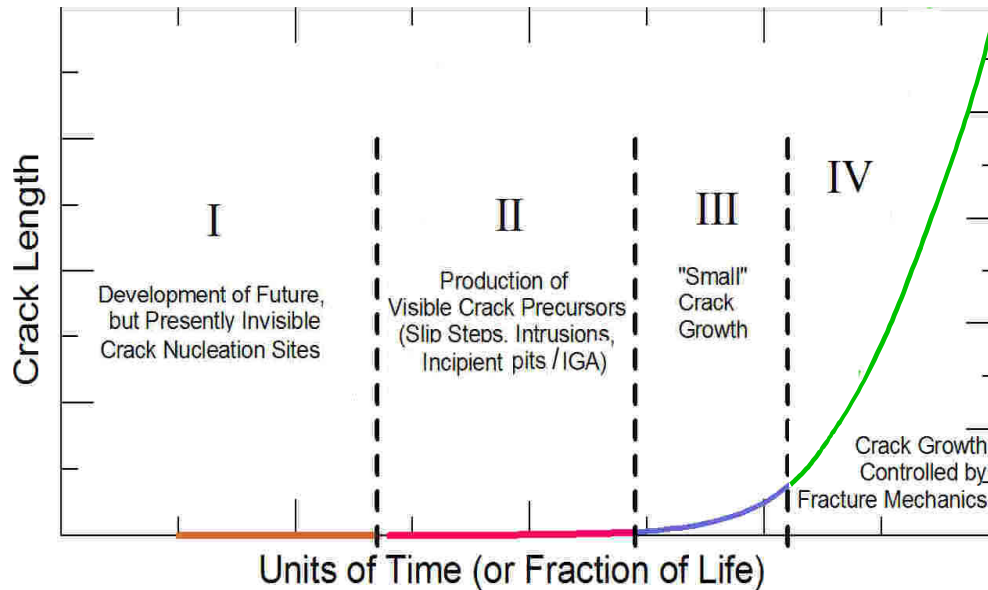
Outline

- PWSCC initiation data needs
- Initiation testing
 - Test methods
 - Challenges
 - Initiation testing example
- Proposed cooperative effort

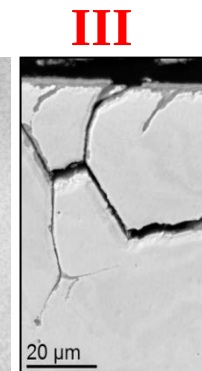
PWSCC initiation data needs

- Alloy 600/182/82
 - Stress and temperature effects
 - Microstructural variations
 - Dissimilar metal weld (DMW) dilution zones and heat affected zones (HAZs)
- Alloy 690/152/52
 - Comparison to 600/182/82 (improvement factors)
 - Weld defects, dilution zones and HAZs
 - Thermal treatment and cold work

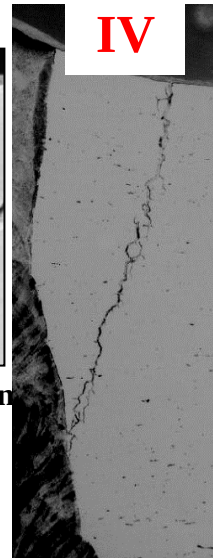
PWSCC initiation testing



**Precursor Damage
Penetrative Oxidation
(0.1-20 μm)**



**SCC Initiation
from
Precursor
Damage
(10-50 μm)**



Initiation testing challenges

- Time for crack initiation may be very lengthy
- Acceptable methods to accelerate testing
- Effects of environmental and material parameters
- Parameter interactions
- Detecting/verifying initiation time
- Only 1 datum per specimen
- Incorporation of data into models/predictions

Test Method Selection

- Multiple individual specimens
 - stress, microstructure, welds
 - replicate specimens
- Instrumented specimens to detect initiation
- Acceleration
- High system reliability with minimum maintenance and adjustment

DOE-NE test systems



- Instrumented tensile specimens
- Up to 30 specimens per autoclave
- Allows testing of cold worked, DMW, weld HAZ and weld defect specimens
- Crack initiation detected using direct current potential drop (DCPD) monitoring

Proposed cooperative effort

- Amend existing MOU in place with DOE-NE and EPRI
 - DOE contributes the testing systems
 - NRC contributes samples (e.g., alloy 600 materials removed from service, alloy 152 welds)
 - EPRI conducts the testing