EMS 182 Notes

November 15, 2025

1 Slide 1

1. Stages of environmental fractures
2. Creep
3. Third item

2 Slide 2 - Environmental Fracture

slow or stable fracture due to combined action of loads and the environmentin a susceptible material

2.1 example: Rolled up plastic hoses

3 Slide 3 - Stages of Environmental Fracture

- Stage 1: Accumulation of internal damage
- Stage 2: Nucleated crack turns into a macroscopic crack
- Stage 3: Rapid fracture

4 Slide 4 - Creep

5 Stress corrosion cracking (SCC) Mechanism

- Slip-dissolution mechanism involves 4 stages: slip, film rupture, anodic dissolution, repassivation
- External stress causes dislocations to move and create slip steps, increasing plastic strain, and breaking the oxide film at the crak tip.

6 SCC Mechanisms

6.1 Stress corrosion cracking SCC

For stage I: $log(da/dt) = cK^m$
For stage II: $log(da/dt) = M/(zF\lambda)i_{curr}$

6.2 SCC - Effect of Microstructure

6.3 Example problem

$PLM = (500 + 273)[17 + log(28 * 365 * 24)]$
$PLM = 17190$
using the graph, $\sigma = 400MPa$