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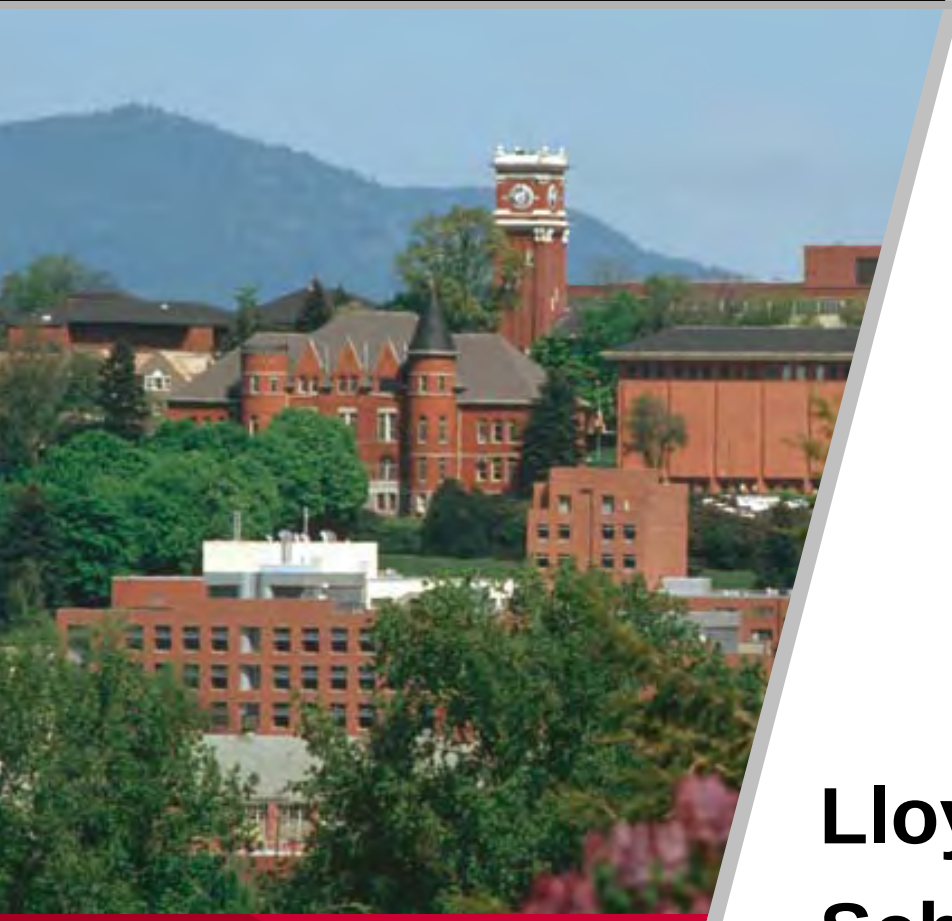
World Class. Face to Face.



Accelerated Degradation of Composites and Their Adhesives

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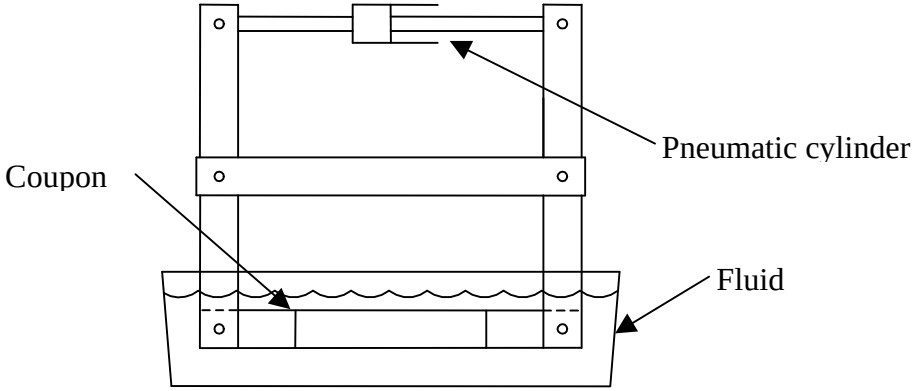
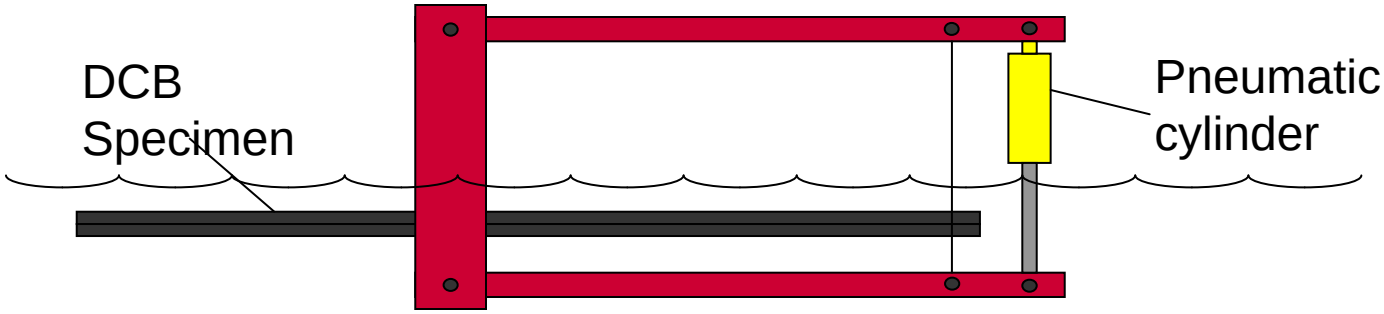
Degradation Observations

- Challenges
  - Slow rate effects (diffusion, creep, reaction)
  - Complex mechanisms
  - Components of exposure can interact
- Approach
  - Combine extreme exposure components
  - Failure surface directly contacts solvent (DCB)
- Need
  - Relate accelerated test duration to field exposure

Methods


Pneumatic cylinder
Coupon
Fluid


DCB
Specimen
Pneumatic
cylinder

Potential Aims

- Consider aggressive environments
  - MEK, sulfuric acid, hydrochloric acid, nitric acid
  - Adhesives and/or composites
  - Measurable degradation within ~6 months
- How does accelerated crack growth relate to long-term degradation?
  - Contribution of environmental components
  - General or material/environment specific?

Potential Aims

- **Interaction of diffusion and degradation**

$$-\frac{d[C]}{dt} = k[C] \qquad \frac{\partial C}{\partial t} = D \cdot \frac{\partial^2 C}{\partial z^2}$$

$$C(t,z) = \int_0^t C_o e^{-k(t-\tau)} \cdot \left[\frac{dC}{d\tau}\right] \cdot d\tau$$

$$\overline{C}(t) = \frac{1}{h}\int_0^h C(t,z) \cdot dz$$