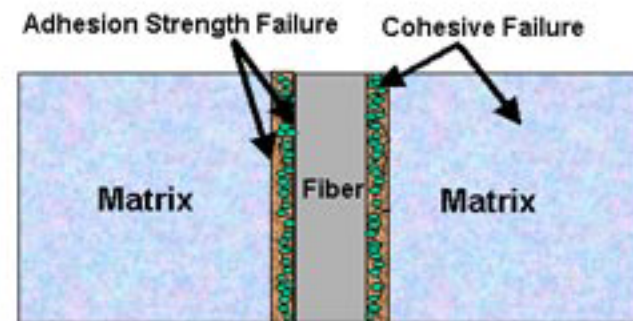


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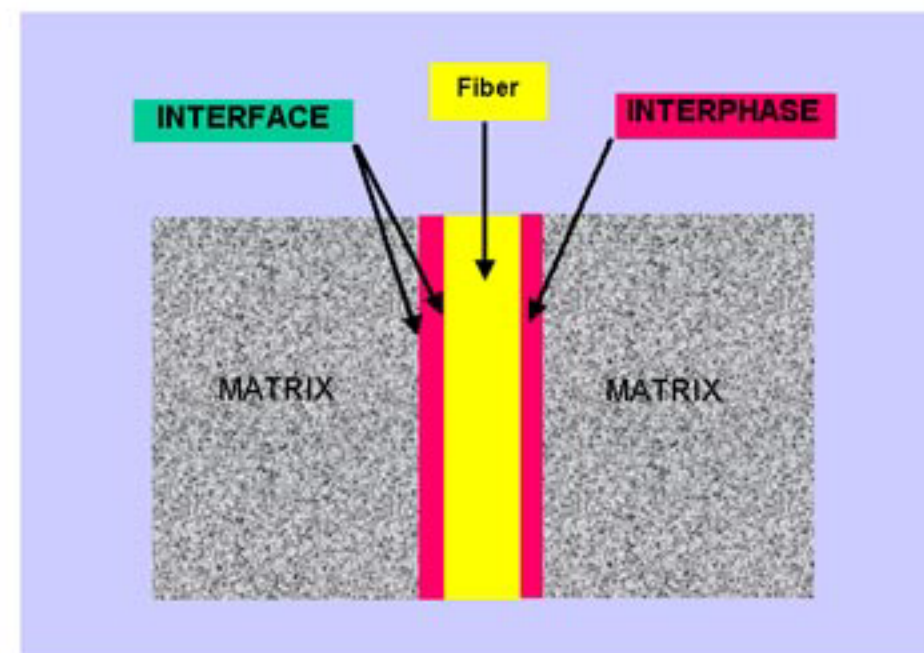
OBJECTIVES

- Characterize the interphase structure as a factor of sizing chemistry
- Tailor the interphase adhesion by varying the functional group on the sizing
- Maximize the energy absorption by tailoring adhesion to the fiber and matrix
- Conduct high strain rate loading test to characterize interphase properties
- Find the failure location and failure mechanism



BACKGROUND

- Interphase: the region that forms in the vicinity of the fiber surface and possesses distinct properties compared to those of the bulk resin.



PREVIOUS WORK

1. Prove the existence of interphase region inside the composite by the following techniques:

- Fracture toughness testing
- Single fiber fragmentation (IFSS)
- Neutron reflectivity
- AFM nanoscale indentation

Property gradients in the interphase

2. Interphase forming mechanism
3. Indicate energy absorption mechanisms:

Preferential adsorption of curing agent

- Fiber-matrix debonding
- Fictional Sliding (higher)

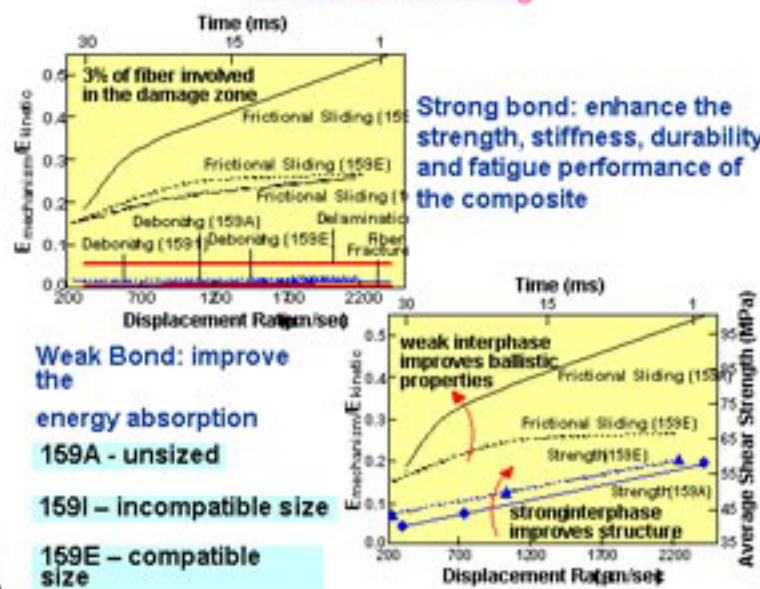
Dynamic Interphase Loading Apparatus

Tailoring Interphase

- Strength
- Toughness
- Ballistic resistance
- Durability
- Load transfer

PREVIOUS WORK

Interphase Strength, Absorbed Energy due to De-bonding and Frictional Sliding



APPROACH - MATERIALS

Materials

1. Matrix --- Epoxy/Amine system
 2. Fiber --- E Glass fiber (10 ~ 25 μm)
 3. Fiber Sizing --- Major Variable
- Film Former: low molecular weight epoxy
 - Surfactant: Triblock ethylene oxide and propylene oxide copolymer
 - Silane Coupling Agent: $(R)_n-Si-(O-R')_{4-n}$

- Concentration
- Reactive group R and R'

APPROACH - PROPERTIES

- Surface Roughness (texture)
- Shear Strength and Absorbed Energy
- Fracture Mechanism
- Interphase Composition
- Interphase Size

APPROACH - EXPERIMENTS

- DILA (Force-Displacement Curve)
- AFM (Texture)
- SEM and TEM (Image of failure)
- XPS and NMR (Composition Analysis)

