Mode I Fracture Mechanics of High Strain To Failure Adhesives

Adhesive Bonding has advantages over mechanical fastening, such as:
- Lighter parts and Assemblies
- Reduced Stress Concentrations
- Less Fabrication Time

There are many applications where Damage Tolerant Adhesives can be beneficial.
- Tanks and many other Military Applications
- Many Parts of Cars Boats and Airplanes
- Anywhere Damage can occur in bonded parts and components

FRACTURE MECHANICS

Because of the large deformation of the adhesive in the crack tip zone Linear Elastic Fracture mechanics cannot be used.
- A cohesive zone is needed to evaluate the different fracture present
- Do not use checkmarks or artistic bullets unless they are part of the message

\[
J = \frac{(P a)^2}{E h^3} + P (w_1 - w_2)
\]

\[
J = \int_0^\infty \sigma(\delta) d\delta - \sigma(0) \int_0^\infty \frac{d\delta}{\delta}
\]

TYPES OF FAILURE

- Cohesive Failure occurs in the middle of the adhesive
- Adhesives Failure occurs at the interface and is usually pulled or peeled from the substrate

COHESIVE LAWS

CONSTRAINED TENSION

- Simple dog bone Tension vs. Constrained Tension
- The block joint constrains the adhesive and prevents contraction
- This makes the adhesive apparently much less compliant

FUTURE WORK

- Determining Rate Dependence effects within the DCB
- Determining the amount the Cohesive Zone, R-Curves and the Adhesive bridging effect

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