

Mode III and mixed-mode interlaminar fracture toughness and the factors affecting it - topic presentation

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Toughness of composites

Can the crack grow?

Requirements to be a material parameter

- Independent of lab, operator and machine

- Not depend on layup

- Be size independent

Does this apply to toughness?

Mode III

Less commonly studied

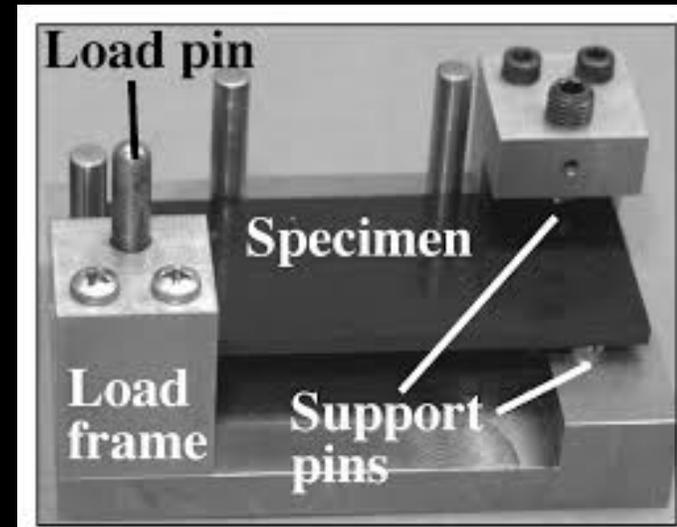
Relevant for bolt holes, impact, ...

Pure mode III = difficult to achieve

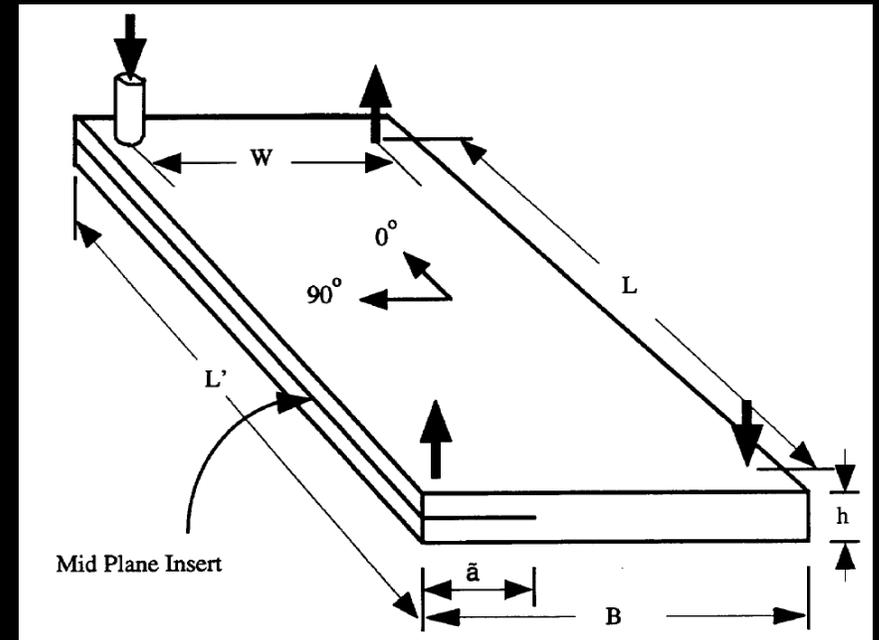
Edge-crack torsion test

Mode III-dominated

Sensitive to boundary conditions



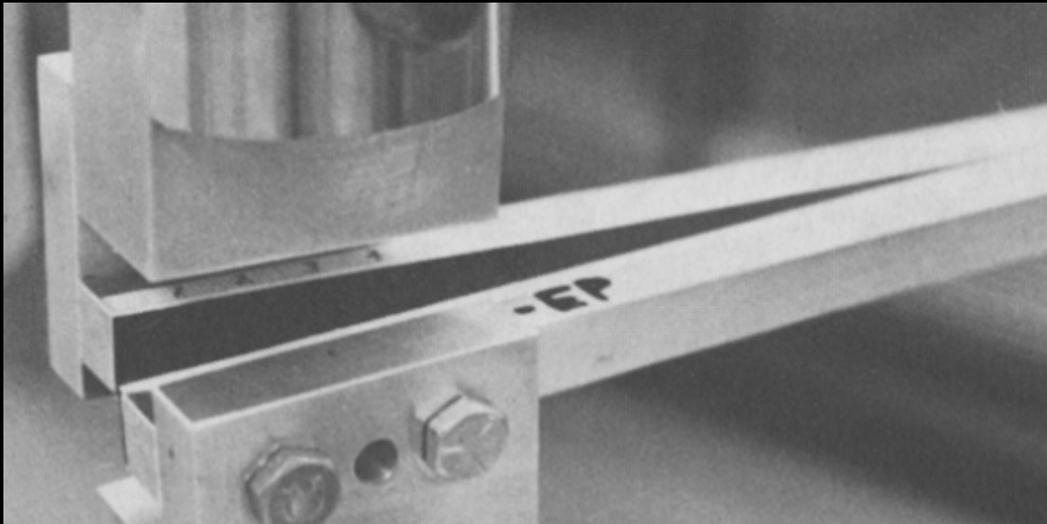
Ratcliffe (2004)



Li et al. (1996)

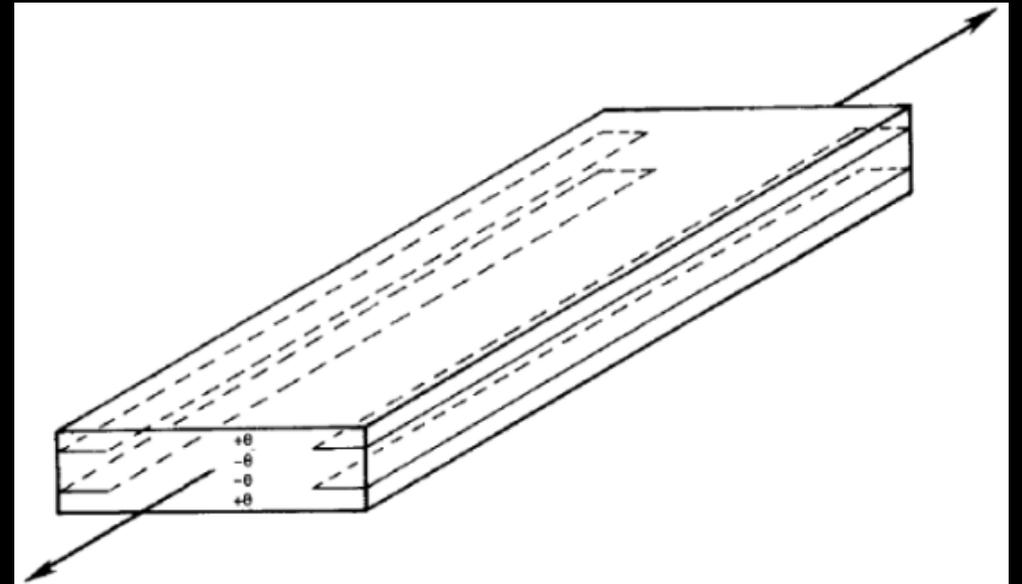
Other mode III tests

Split cantilever beam



Donaldson (1988)

Angle-ply edge delamination test



Li et al. (1996)

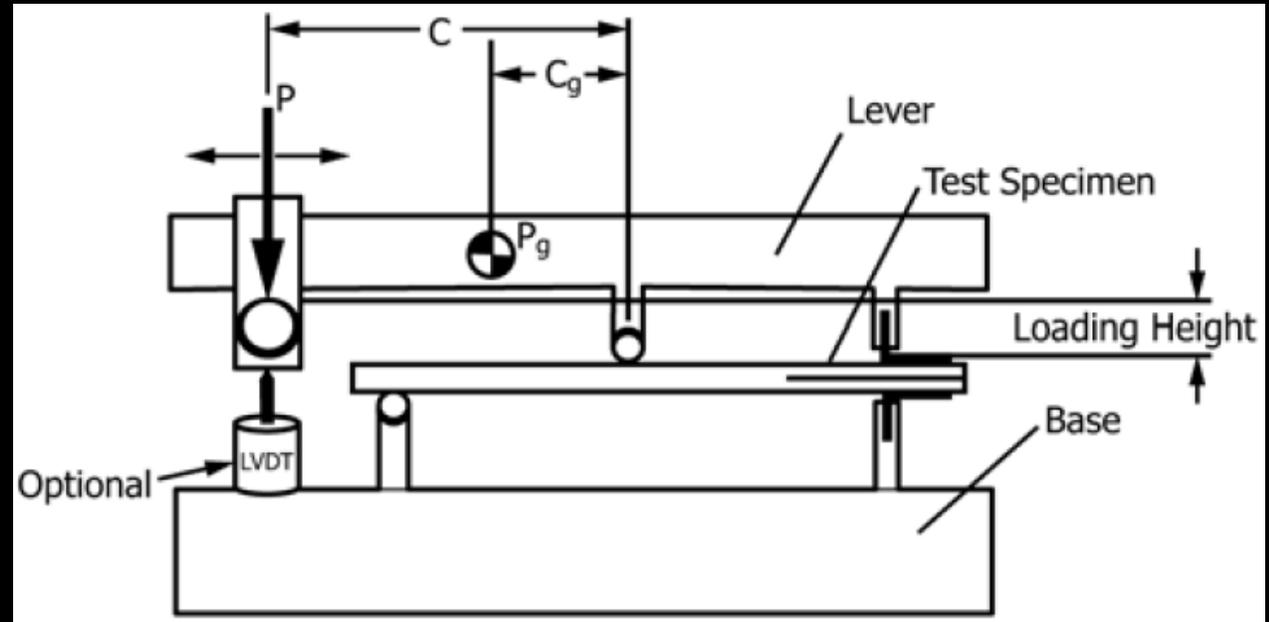
Mixed-mode bending (MMB) test

Only standardised test: ASTM D6671

Requires:

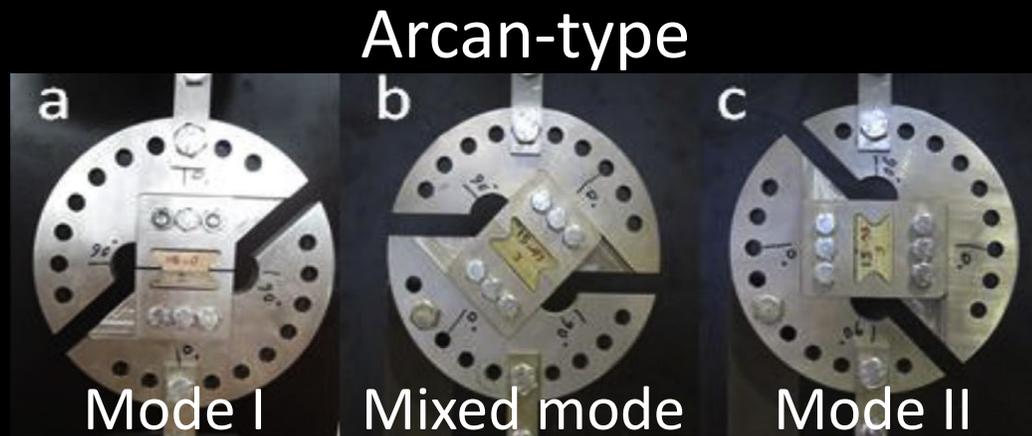
Elastic moduli

Accurate crack length



Alternatives to MMB tests

Other data reduction schemes



Alizadeh & Guedes Soares (2019)

Asymmetrically loaded double cantilever beam



Conclusion

Some of the most challenging tests for composites

Difficult data extraction

Many different test methods available

Does mode III even exist for a 0/0 interface?

Can mode III be distinguished from mode II?