

Optical Evaluation of Edge and Diffuse Delamination

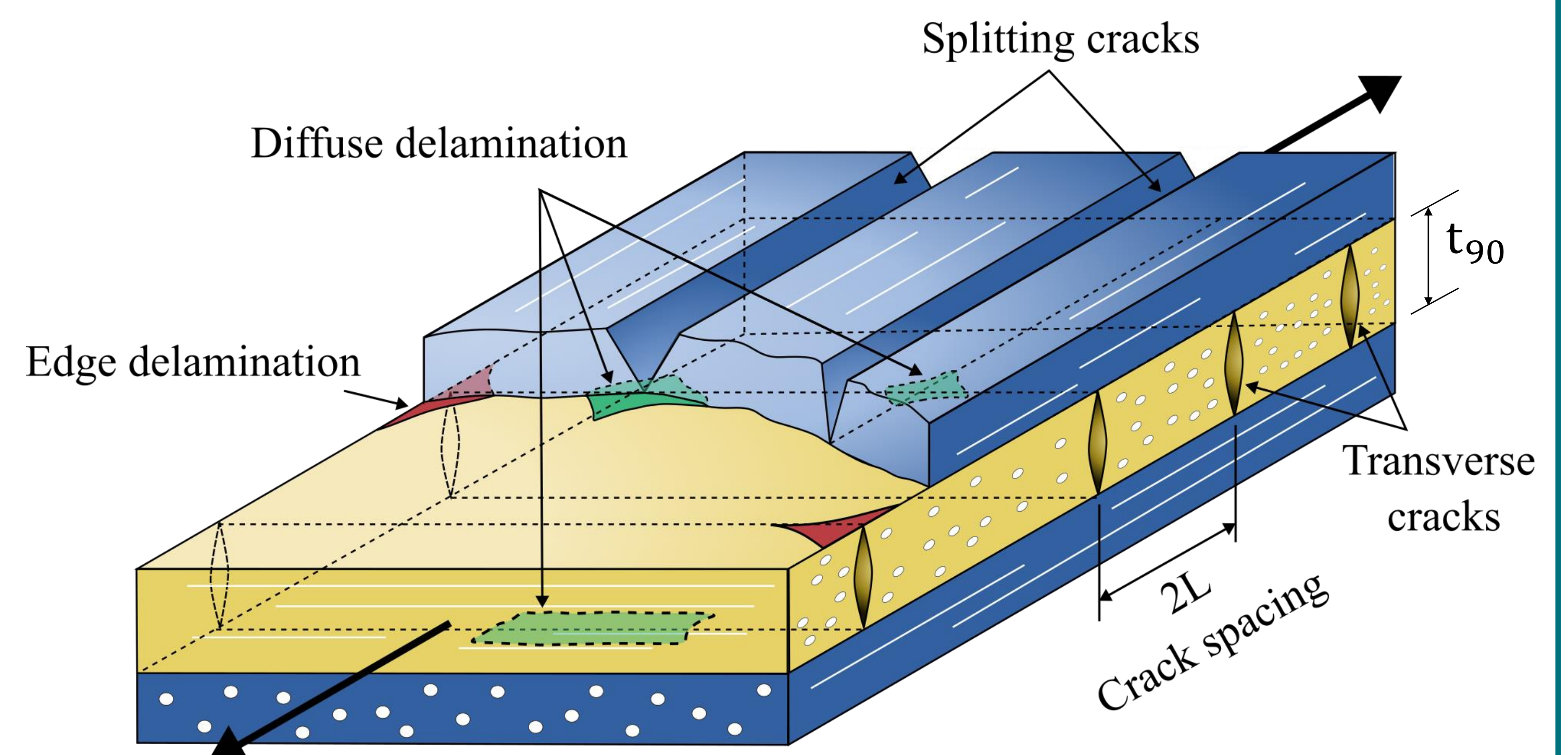
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Introduction

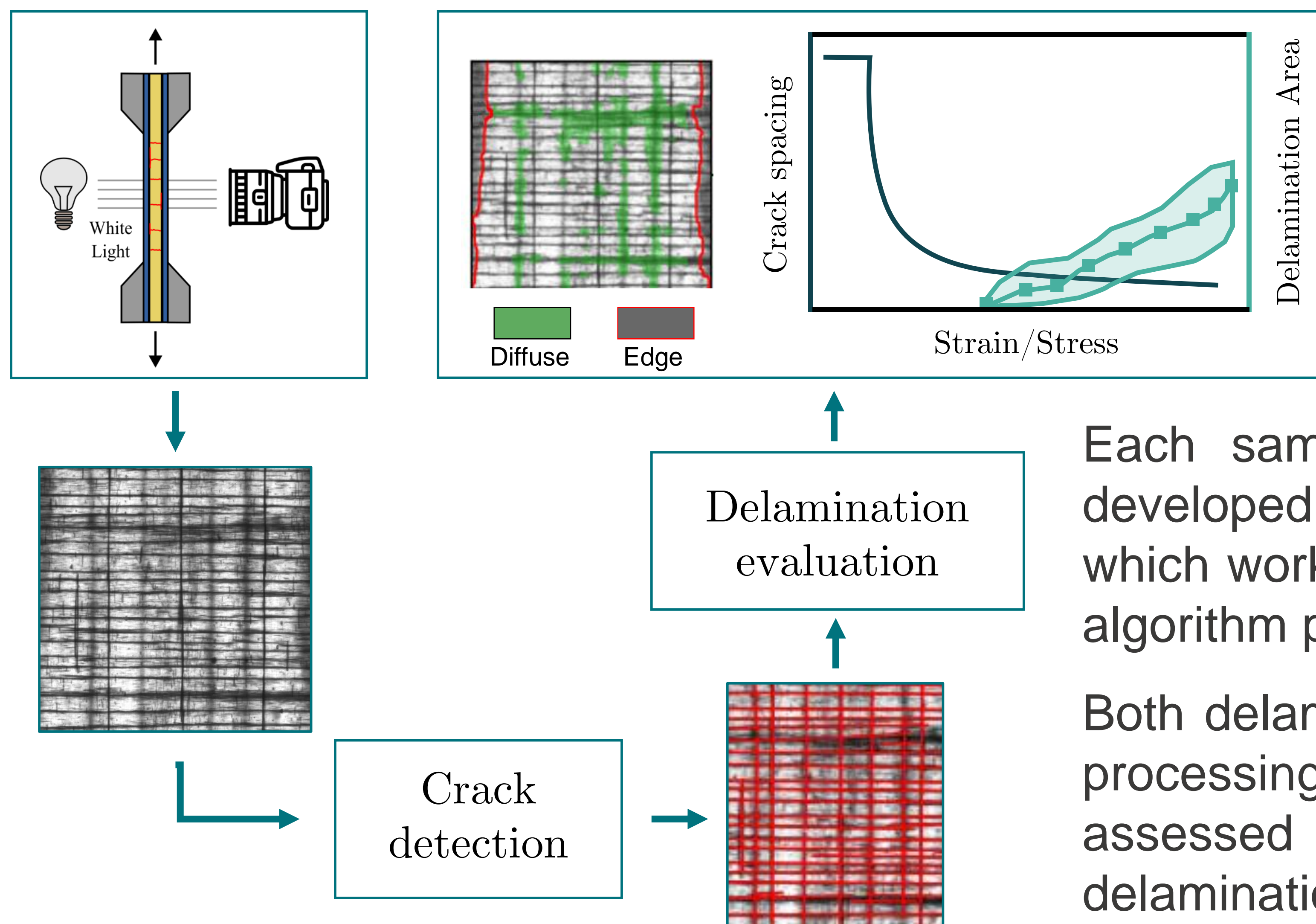
In composite materials, transverse or intralaminar cracks represent the initial type of damage.

While these cracks alone do not lead to structural failure, they trigger subsequent damage mechanisms such as diffuse and edge delamination.

Diffuse delamination initiates at the interface when the inner ply exceeds its load capacity and edge delamination originates at the crack tips near the edge due to the edge effect.



Methodology



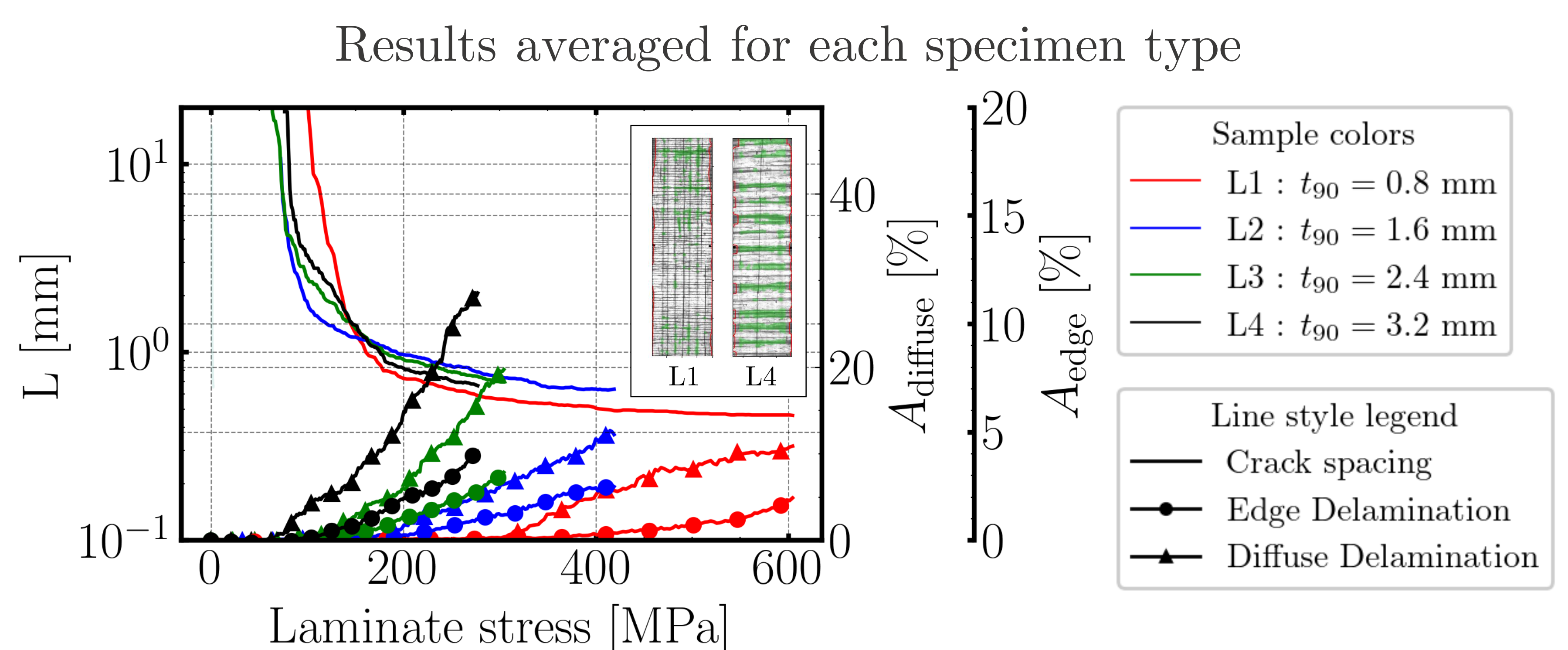
Glass Fiber Reinforced Polymer (GFRP) cross-ply samples with different inner layer thicknesses are studied under uniaxial tension. Each test is recorded using a camera setup.

Each sample is evaluated using **DelaDect**, an algorithm developed to quantify both edge and diffuse delamination, which works as an extension of **CrackDect**, a crack detection algorithm proposed by [Drvoderic, M. et al, 2021].

Both delamination types are quantified as areas using image processing techniques, with diffuse delamination being assessed near previously detected cracks and edge delamination near the edges.

Results and Conclusions

- For thin inner-ply (L1), transverse cracking starts at higher stresses values;
- Bigger delamination areas are observed for thick inner-ply;
- Diffuse delamination for thick inner-ply form as bands over the whole width, whereas for thin inner-ply spread locally around crack intersections.



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Research topics: Composite Materials

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