Determination of in-situ Interlaminar Fracture properties of Composites

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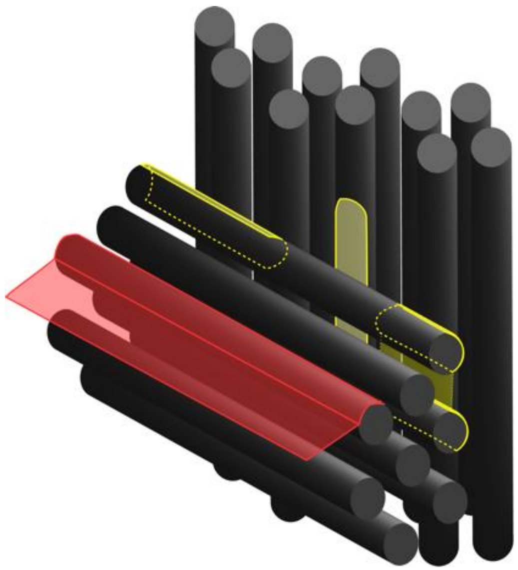
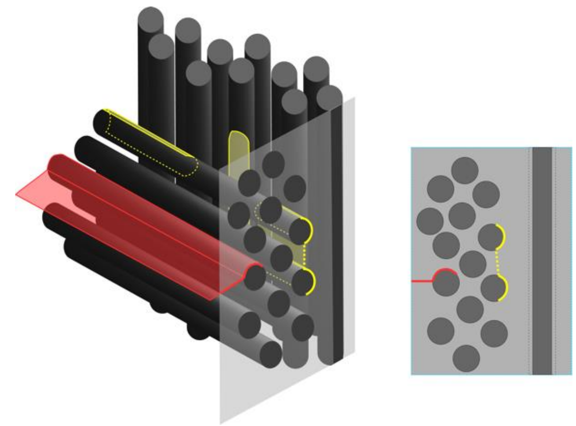
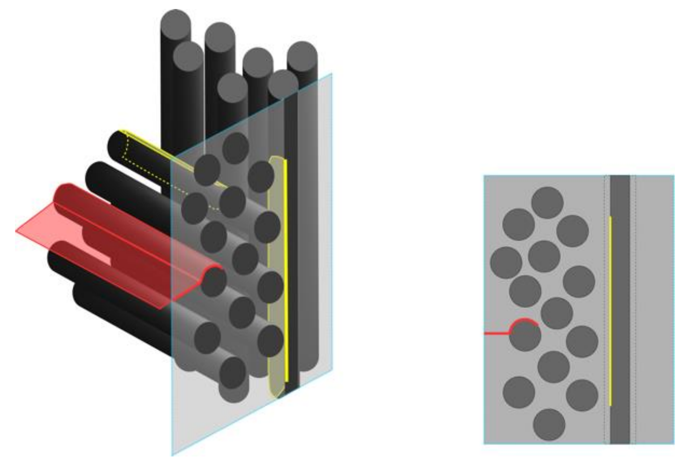
GRUPO DE ELASTICIDAD Y RESISTENCIA DE MATERIALES



General damage scheme (only fibres are represented) consisting in debonds of fibres from the matrix in the 0- and 90-degrees plies (in yellow in the figure), involving the presence of a transverse crack (in red in the figure).



Damage onset of delamination involving just debonds in the 90-degrees ply.



Damage onset of delamination involving just debonds in the 0-degrees ply.

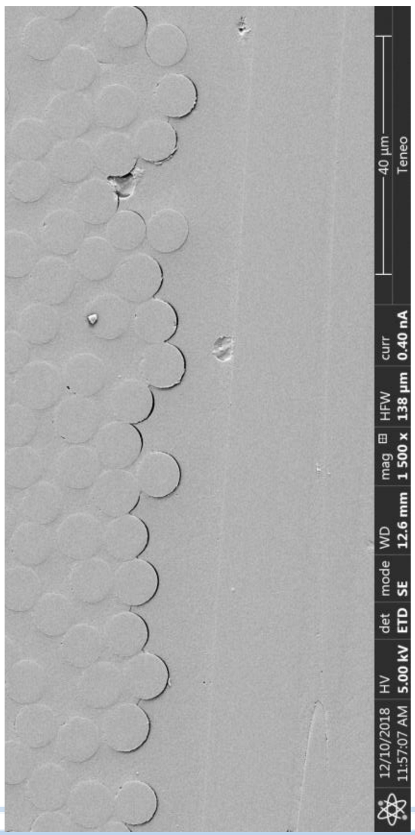
GRUPO DE ELASTICIDAD Y RESISTENCIA DE MATERIALES

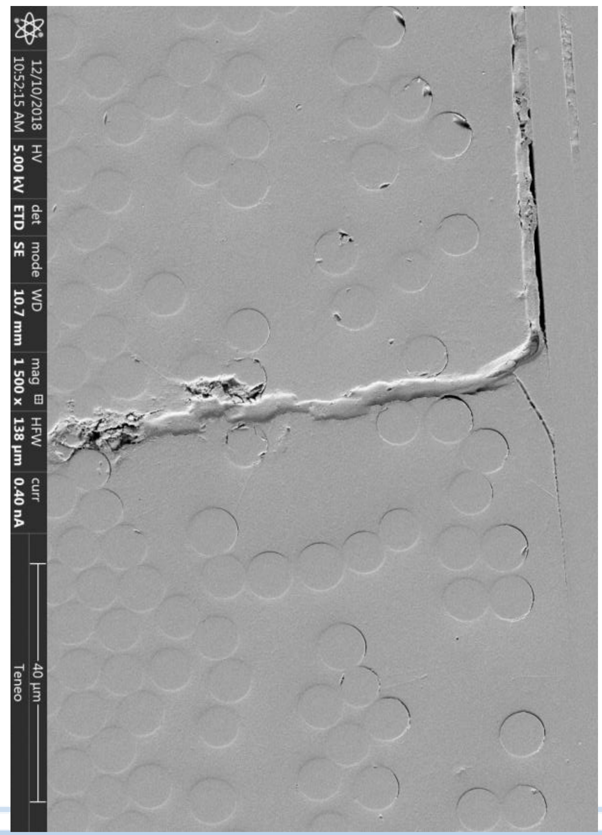
Interlaminar damage in a $[0,90]_S$ laminate:

a) debonds in fibres of the 90-degrees ply,

b) debonds in fibres of the 0-degrees ply associated with the presence of a transverse crack.

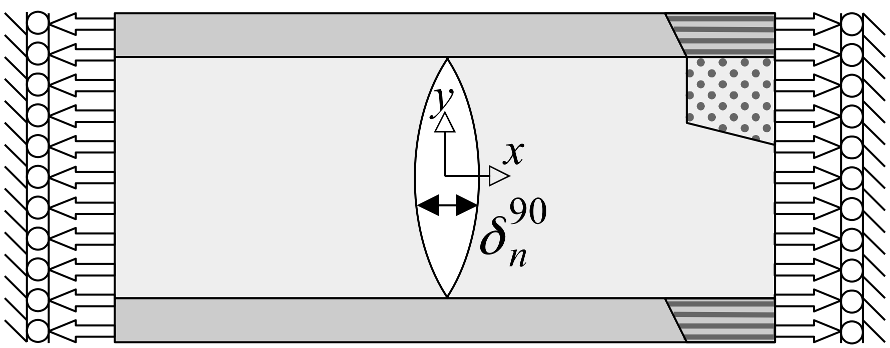
a)





b)

a)



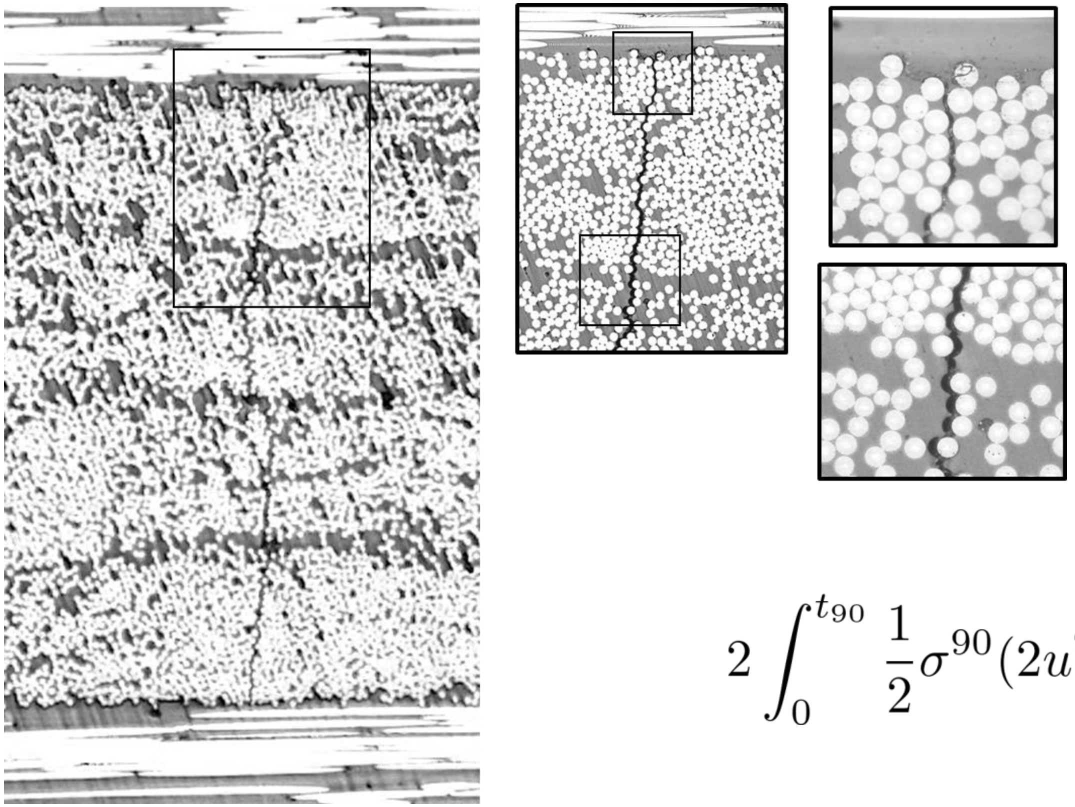
b)

Configurations studied:

a) full transverse crack in the 90-degrees ply,

b) full transverse crack in the 90-degrees ply with delamination between 0- and 90-degrees plies.

Micrograph of a representative morphology of damage in a [0_4,90_4,0_4].

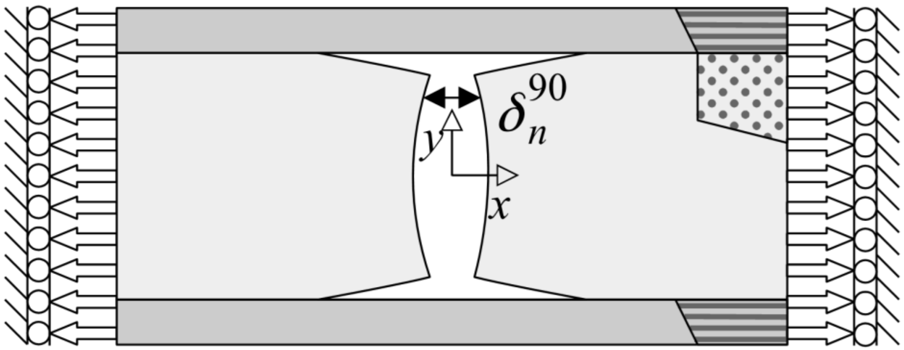


$$2\int_0^{t_{90}} \frac{1}{2}\sigma^{90}(2u^{90})\mathrm{d}y = G_{IC}^{90}(2t_{90})$$

$$G_{IC}^{90} = 129.68\mathrm{J/m^2}$$

a)

b)

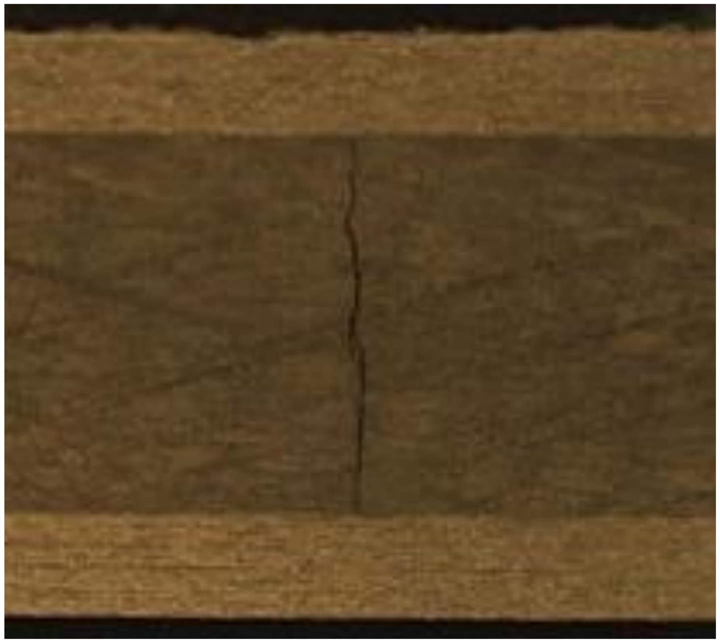


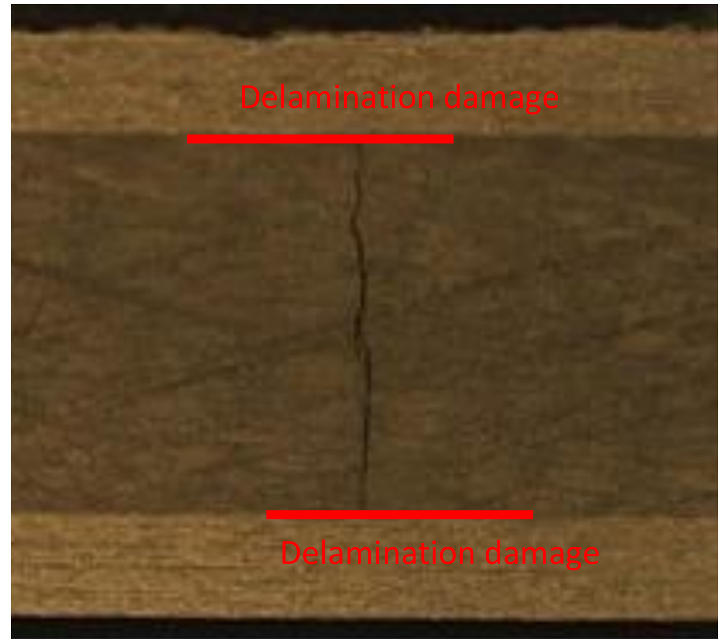
Configurations studied:

a) full transverse crack in the 90-degrees ply,

b) full transverse crack in the 90-degrees ply with delamination between 0- and 90-degrees plies.

Micrograph of a representative morphology of damage in a $[0_4,90_{16},0_4]$.

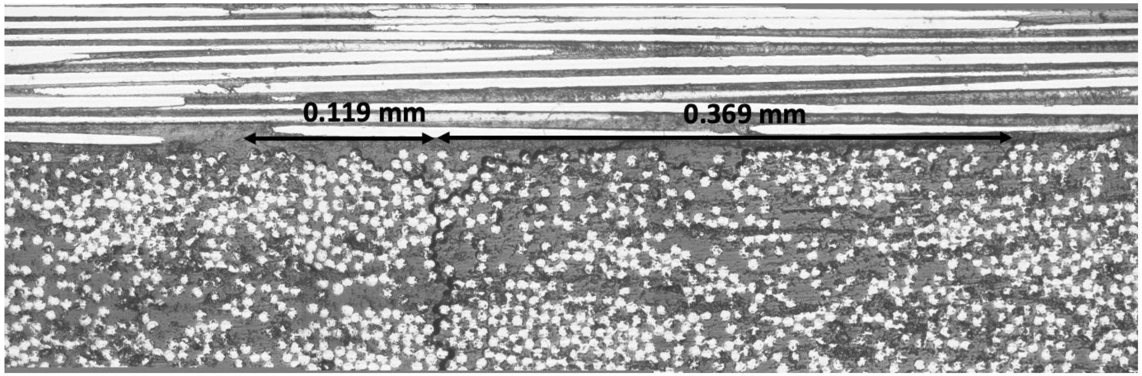


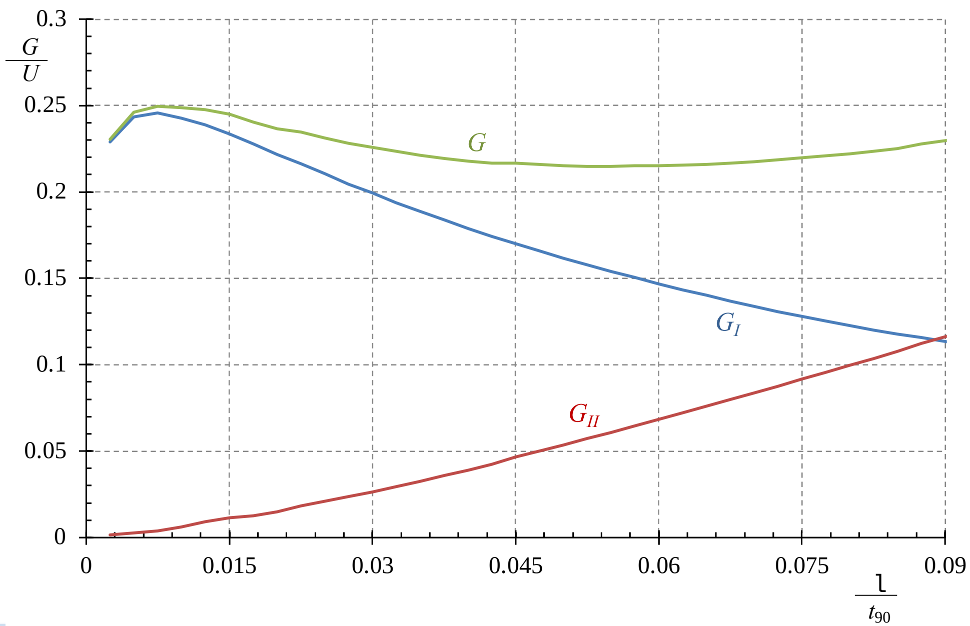


$$2\int_0^{t_{90}} \frac{1}{2}\sigma^{90}(2u^{90})\,\mathrm{d}y = G_{IC}^{90}(2t_{90}) + G_{C}^{0/90}(4s)$$

$$G_{IC}^{0/90} = 60.215\mathrm{J/m}^2$$

Damages involving delamination





Evolution of G, G_I and G_{II} of the delamination crack in the range of damage like delamination crack observed

$$U = \frac{1}{2}\sigma^{90}\varepsilon_R(2t_{90})$$

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