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Cohesive law shape effects on the strength prediction of adhesive joints with cohesive zone models

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Bonded joints are widely used in several fields of engineering, as an easy and efficient method to join components. Cohesive Zone Models (CZM) have been used in the last decade for their strength prediction, allowing simulation of damage growth within bulk regions of continuous materials or interfaces. Compared to conventional FE, a much more accurate prediction is achieved, as this technique provides an accurate representation of the entire failure process [1]. A useful feature of CZM is that different shapes can be developed for the cohesive laws, depending on the material or interface to be simulated, allowing a faithful representation of the fracture processes. The triangular and trapezoidal CZM shapes are most commonly used for strength prediction of typical structural materials [2]. This work studies the influence of the CZM shape used to model a thin adhesive layer in single-lap adhesive joints, for an estimation of its influence on the strength prediction under different material conditions. As a result of this study, some conclusions were established to assess the importance of using a CZM shape for a given adhesive that faithfully represents its behaviour, under different material behaviours (a brittle and a ductile adhesive were tested). The viability of using a triangular CZM that is easier to use, without compromising the accuracy of the results, was also assessed.

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