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ESTIMATING THE AVERAGE SIZE OF FIBER/MATRIX INTERFACE CRACKS IN UD AND CROSS-PLY LAMINATES

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Characterization of fiber/matrix interface cracks (debonds) has mainly focused on the evaluation of the Energy Release Rate (ERR). However, the attention has been mostly devoted to the study of a single partially debonded fiber placed in an effectively infinite medium and to the effect of a small number of nearby fibers on debond ERR [1]. In this work, the Mode I and Mode II ERRs are evaluated for debonds appearing in Representative Volume Elements (RVEs) of regular microstructures of UD (Fig. 1) and cross-ply laminates. By adopting a 2-parameters energy-based criterion for propagation [2], we then proceed to the estimation of the expected average debond size in different microstructural arrangements (see Fig. 1). Finally, the results are compared with available microscopic observations [3].

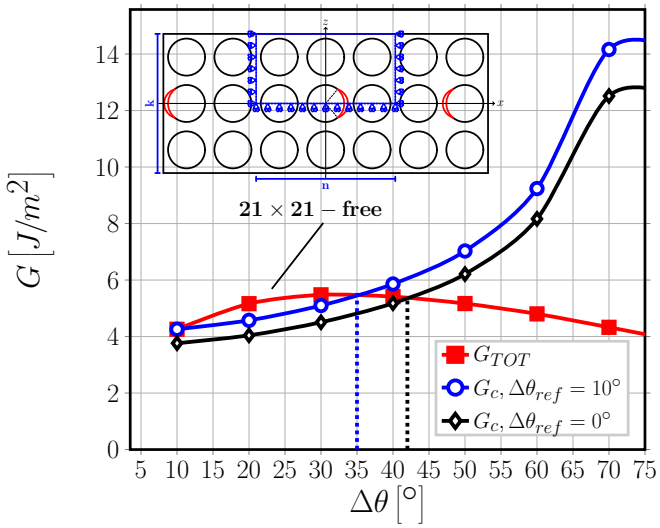

Figure 1. Estimation of debond size by comparing the total ERR to the 2-parameters expression of critical G_c. Glass fiber/epoxy, $V_f = 60\%$, $\varepsilon_x = 1\%$.

References

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