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INCREMENTAL DELAMINATION PROCESSES UNDER CYCLIC LOADING

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ABSTRACT

Dleamination of composite laminate structures is a well known failure mechanism which represents one of the major concerns of modern composite structures.

Experimental studies on the above phenomena are well developed and already standardized in international codes, at least under incremental increasing loads in simple mode I opening mode, as well as for mixed (opening-sliding) fracture mode. The numerical simulation of such nonlinear fracture propagation processes are commonly conduced by means of Finite Elements associated with mechanical interfaces, in which cohesive fracture mechanic cohesive models are adopted as interface constitutive relations.

The present contribution explores a rather new aspect in which oligocyclic fracture propagation is observed under a rather low number of cyclic (loading-unloading) external actions. In particular it is examined the effect induced by friction which develops for partially damaged cohesive zone, as well as in the fully damaged (delaminated) composite structure in unloading compressive sliding mode. Beside experimental results, a recent interface model developed by the authors for general loading paths is presented. It is shown as the FE simulation, with the proposed interface, is able to deal with cyclic opening-sliding frictional-closing processes. The numerical results will be presented, compared with experimental simulations and some final remarks will be opened for discussion.