COMPUTATIONAL MODELLING OF BIMATERIAL INTERFACE FAILURE IN VIEW OF RUBBER-STEEL INTERFACE

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This paper presents a brief review of selected approaches used for computational modelling of bimaterial interface failure and for evaluation of interface failure resistance. Attention is paid to the approaches that assume absence of initial interface crack. The applicability of such approaches to rubber-steel interface failure evaluation is discussed in the paper. The approach based on the so called 'cohesive zone model' is preferred and demonstrated by an example of computational modelling of rubber-steel interface failure during a peel-test. The results of peel-test computational modelling are presented. The influence of cohesive zone element number on the results is also analysed. The results are consistent with experimental data.

Key words: *computational modelling, interface failure, bimaterial interface, adhesion strength, cohesive zone model, peel-test, rubber*

1. Introduction and motivation to computational modelling of bimaterial interface failure

Efforts to predict reliability of components have raised the need of mathematical description of respective ways of failure. For the reliability of mechanically loaded bodies, limit states related to crack initiation and propagation are often decisive. In case of composite materials, we can distinguish between the failure inside the respective material components and the failure at the bimaterial interface. The interface is often the weakest element of the loaded structure; therefore properties of bimaterial interface can strongly influence the reliability of the composite structure as a whole.

This paper presents a computational model of bimaterial interface failure and deals with the possibility of how to evaluate interface failure resistance on the basis of computational modelling. First, this paper outlines some approaches used when evaluating load values corresponding to the interface failure. In this paper *'interface failure'* means the change in interface status after which no tensile tractions can act in the interface point under consideration. Though, recently, the behaviour of cracks at/near the bimaterial interface and the influence of the crack on the interface failure have been intensively investigated, this is not the subject of the present paper. Attention is paid to the approaches that do not consider or assume location and orientation of any initial structural imperfections (cracks).

The problem of interface failure resistance evaluation is not related only to 'common' composite materials (e.g. glass or carbon fiber in polymeric matrix) but it is of more general importance – additionally e.g. strength evaluation of glue-joints (aeronautical industry) and

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