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MODE DECOMPOSED *J*-INTEGRAL FOR 3D CRACK PROBLEMS USING A COHESIVE ZONE MODEL

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The assessment of energy available for crack growth is commonly determined by means of the *J*-integral [1]. Its general expression at a point on a three-dimensional crack front is a path independent combination of a contour integral and a surface integral defined over the area enclosed by the contour [2]. However, only the contour integral is retained when applying the *J*-integral to a cohesive zone model, since its path independence is employed to shrink the integration contour to the cohesive interface (Figure 1). Moreover, the integration domain of the pointwise-evaluated *J*-integral is in a plane perpendicular to the crack front and coinciding with the crack propagation direction. For this reason, the proper identification of the crack growth direction, usually assumed to be normal to the crack front, is required.

In this work, an expression for the J-integral evaluation in three-dimensional crack fronts using cohesive elements is presented in conjunction with a crack propagation direction criterion that can be evaluated at element level. The formulation, when employed to compute the mode-decomposed *J*-integral in several specimens under different mode ratios (I, II and III), leads to results in agreement with the VCCT predictions.

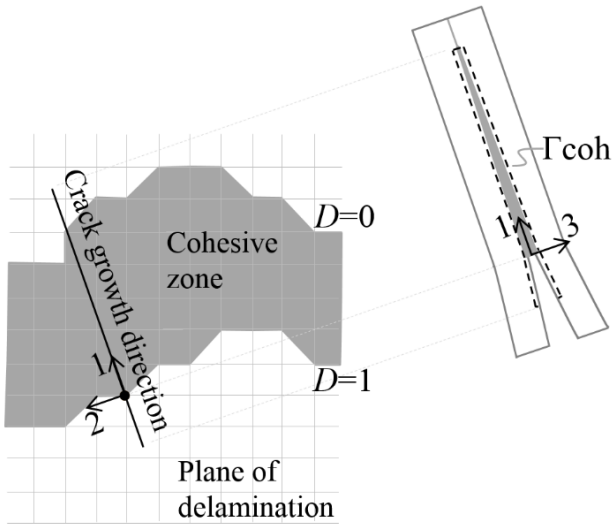

Figure 1. Integration contour of the J-integral in a 3D cohesive zone model.

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