

Crack Arrest Model for Cracked Piezoelectric Plate – a Modified Dugdale Approach

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A modified Dugdale model is proposed for a piezoelectric plate weakened by a hairline straight crack. Two cases investigated are: when the crack lies perpendicular and parallel to poling direction of the plate. Uniform constant unidirectional tension and electric field applied remotely opens the faces of the crack in Mode I type deformation. Consequently the plate is yielded mechanically and also electrically. The piezoelectric plate being electrically ductile and mechanically brittle, first encounters mechanical singularity. Thus plastic zone formed ahead of the crack tip is encountered first. To arrest the crack from further opening the rims of plastic zones developed are subjected to normal cohesive linearly varying yield point stress of the plate. Each of the problems is solved using complex variable technique and the condition that the stress remains finite at every point of the plate. The local energy release rate and stress intensity factors are calculated.

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