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Review

A review of *T*-stress and its effects in fracture mechanics

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ABSTRACT

An overview of past research on *T*-stress is presented in this paper. Beginning with the origin of *T*-stress, the authors discuss different phenomena associated with *T*-stress: crack path stability, isochromatic fringes pattern, plastic zone influence and constraint parameter. Different methodologies—experimental, analytical and finite element methods—used to evaluate *T*-stress are discussed and studies are categorized under these methods also. Thereafter, the authors provide a critical review for the role of *T*-stress in predicting crack paths stability because it conflicts with the origin of *T*-stress. Finally, it concludes with a concise summary of the research on *T*-stress.

Contents

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Nomenclature

B	biaxiality parameter
BEM	boundary element method
BL	boundary layer
CCP	center cracked plate
CN	centrally notched
CT	compact tension
CTOD	crack tip opening displacement
DCB	double cantilever beam
DEC	double edge-cracked
DECP	double edged cracked plate
DIC	digital image correlation
EEVM	eigenfunction expansion variational method
FEM	finite element method
FFEM	fractal finite element method
FGM	functionally graded materials
HCE	hybrid crack element
LEFM	linear elastic fracture mechanics
K_I	Mode I stress intensity factor
K_{II}	Mode II stress intensity factor
LSY	large scale yielding
MBL	modified boundary layer
MHS	maximum hoop strain
MT	middle tension
MTS	Maximum Tangential Stress
PMMA	polymethyl methacrylate
PZ	plastic zone
SCP	surface cracked plate
SECP	single edged cracked plate
SED	strain energy density
SEN	single edge notched
SENB	single edge notch bend
SERR	Strain Energy Release Rate
SIF	stress intensity factor
SSY	small scale yielding
TDCB	tapered double cantilever beam
a/w	crack aspect ratio
a/W	crack depth to width ratio
f_o	stress fringe order
h_{pw}	actively yielding region normal to the crack plane (mm)
J_C	fracture toughness
t	thickness (mm)
β	biaxiality