

Deformation, failure, fracture and strength reliability of structural materials

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Outline

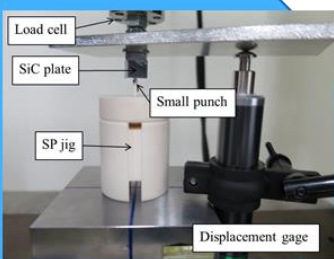
"How do it break? (fracture mechanism)" and "How long can it be used ? (strength and life)" are need to know because mechanical structures require high safety and reliability. It is very important to use the materials after wide mechanical tests because using materials without fully understanding the mechanical properties is carried risk. In this research, the fracture mechanism and the strength reliability of structural materials (i.e., ceramics, plastics, metals, and composite materials (CFRP)) are investigated via mechanical tests and theoretical analysis. We propose "how to use" structural materials.

Research

Ceramics



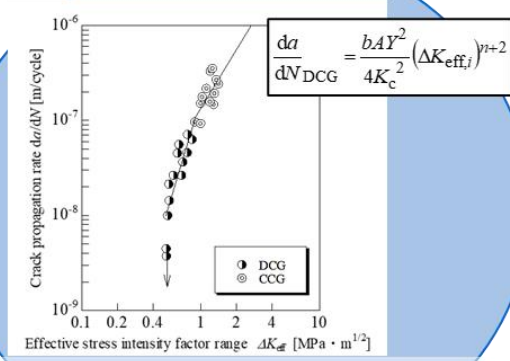
Fracture morphologies of ceramic balls after water quenching.



Schematic of small punch (SP) test.

Keywords: Brittle fracture, Ceramic ball, Small punch test, Thermal shock, Hertz fracture, Slow crack growth, Strength reliability

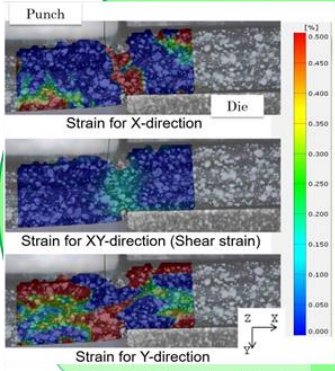
Plastics



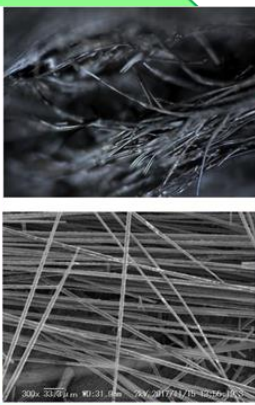
Measured and fitted fatigue crack propagation diagrams for DCG and CCG for R=0.

Keywords: Polycarbonate, Fatigue crack propagation

Composites




DIC analysis and deformation behavior during punching process.



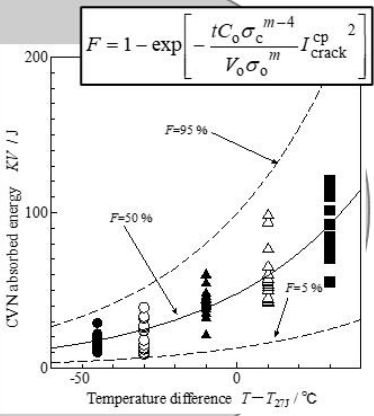
Images of carbon fiber after removal of resin from a unidirectional carbon fiber reinforced plastic laminate by a high-voltage electrical treatment.

Keywords: CFRP, Punching, Out-of-plane shear loading, Electrical treatment

Metals



Rotating bending fatigue machine



A brittle fracture model for a notch root and probabilistic prediction of CVN transition curves of QT-high strength steels.

Keywords: S-N diagram, Very high cycle fatigue, Charpy impact test

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Keywords : Structural materials, Fracture mechanism, Fatigue, Thermal shock, Contact fracture, Accidents and troubles

