JOURNAL OF MATERIALS SCIENCE 16 (1981) 283–284

Erratum

A failure analysis of the micromechanisms of fracture of carbon fibre and glass fibre composites in monotonic loading

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J. Mater. Sci. **16** (1980) 2619–2635

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-men can be viewed from both sides. Several hundred values of fibre debond length and fibre pull-out length can be made in this way which are then tabulated.

There are, of course, difficulties and ambiguities in a fractographic analysis of this sort. There is the assumption that the profile of the fibre debonded region does not change through the thickness of the bundle of fibres. Turning the test-piece over and examining from both sides will check this. A normal distribution of pulled out lengths of fibre from zero is assumed, where the fibre breaks on the fracture plane of the matrix, and the maximum pull-out length is lp. The average fibre pull-out length is therefore $lp/2$. It is also assumed that each fibre is extracted from its matrix socket without the attachment of fragments of resin onto the surface.

2.2. Statistical analysis of failure data

The statistical prediction of failure relies on the characterization of a flaw strength distribution function [6]. One form of the extreme value distribution is

$$S = \exp(-\sigma/\sigma_0)^m V, \qquad (1)$$

where S is the probability of survival, σ is an applied stress on a specimen of volume V, and m and σ_0 are the extreme value distribution parameters. The variability of a set of data decreases as m increases; m and σ_0 therefore characterize the material for prediction of structural reliability.

In logarithmic form, Equation 1 can be written

$$\ln(-\ln S) = m(\ln\sigma - \ln\sigma_0); \quad (V = 1), \quad (2)$$

where m is the gradient of a linear plot of $\ln(-\ln S)$ and $\ln\sigma$, and $\sigma = \sigma_0$ when $S = e^{-1} = 0.37$.

Each mechanism of failure in a fibre composite is affected by the statistical aspects of fibre–matrix bond strength, fibre strength and the distribution of weak points along the length of fibre. This is why a broken fibre composite has a variability of lengths of fibres protruding above the

0022–2461/81/010284–01$02.10/0