Raw test data was processed to calculate dU_{cyc}/dN, dU_{tot}/dN, G_{max} and $\left(\Delta\sqrt{G}\right)^2$. The steps taken in data processing are given as under. Following steps are carried out using fatigue test data at 40°C and R=0.61.

- Crack length calculated from the CCD camera images is plotted against number of cycles N.

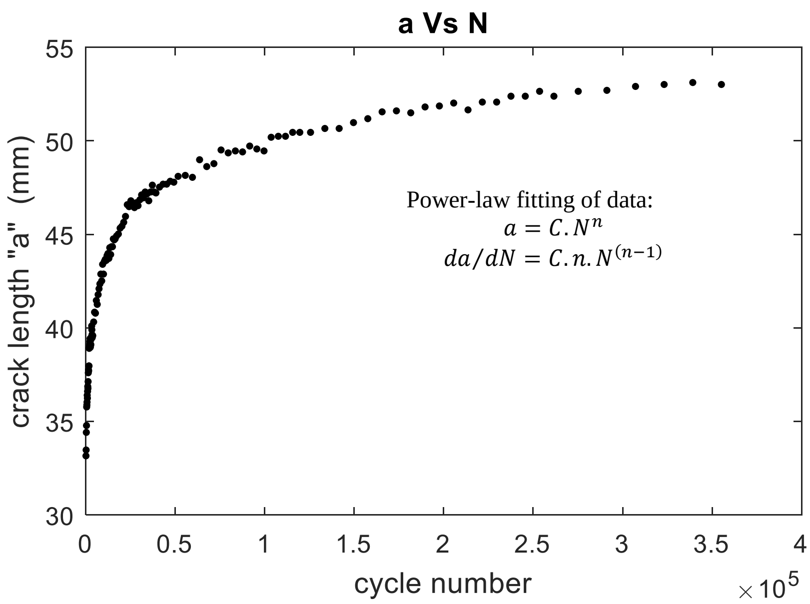

Figure 1 "a Vs N" plot with curve fitting

- Derivative of the power-law fit equation shown in Figure 1 gives the slope of the curve which is the rate of growth of fatigue crack i.e. da/dN.
- Rate of formation of crack surface dA/dN is obtained by multiplying da/dN with width of the DCB specimen b.
- Maximum and minimum strain energy release rate G_{max} and G_{min} was calculated using the compliance calibration method given in ASTM 5528-01 (2007).

$$G = \frac{nPd}{2ba} \qquad (1)$$

Where P is the applied load, d is the displacement, a is the crack length and b is the specimen width. n is the slope of the plot between $\log C$ and $\log a$. n was calculated for every test data. Where C is compliance (displacement/load).

$$C = \frac{d_{max} - d_{min}}{F_{max} - F_{min}} \qquad (2)$$

- $\left(\Delta\sqrt{G}\right)^2$ or simply $\left(\Delta\sqrt{G}\right)$ was calculated as suggested by (Rans, et al., 2011)

$$\left(\Delta\sqrt{G}\right)^2 = \left(\sqrt{G_{max}} - \sqrt{G_{min}}\right)^2 \tag{3}$$

- In the fatigue loading, cyclic energy U_{cyc} and monotonic energy U_{mono} can be defined from the load-displacement diagram Figure 2.

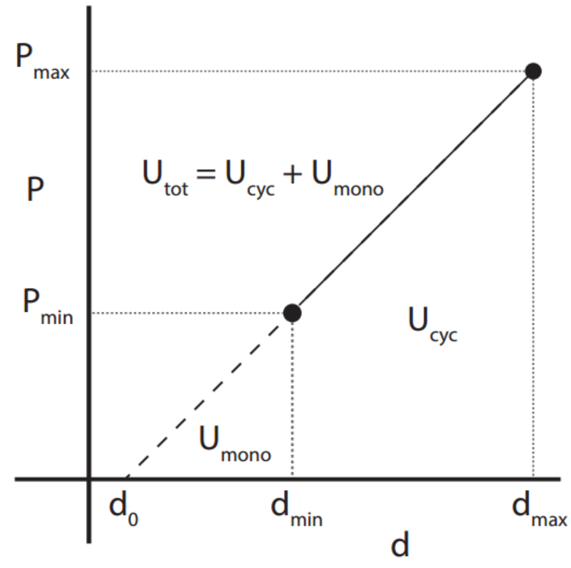

Figure 2 Load-Displacement diagram with the definition of U_{mono} and U_{cyc} (Pascoe, et al., 2016)

Where U_{cyc} is the energy that is supplied to the DCB specimen during each loading half cycle. U_{mono} is the energy that is still in the specimen after the unloading half cycle. Furthermore, it was observed that in most of the cases the curve plotted between $P - d$ does not pass through the origin which means that there is still some value of displacement (d_o) when force F is zero as shown in Figure 2.

From Figure 2, U_{cyc}, U_{mono} and U_{tot} can be defined as under.

$$U_{cyc} = \frac{1}{2}P_{max}(d_{max} - d_0) - \frac{1}{2}P_{min}(d_{min} - d_0) \tag{4}$$

$$U_{tot} = \frac{1}{2}P_{max}(d_{max} - d_0) \tag{5}$$

Where U_{tot} is the sum of U_{mono} and U_{cyc}. Cyclic and total energy are calculated from the raw test data and plotted against number of cycles N. U_{cyc} and U_{tot} are plotted against number of cycles N.

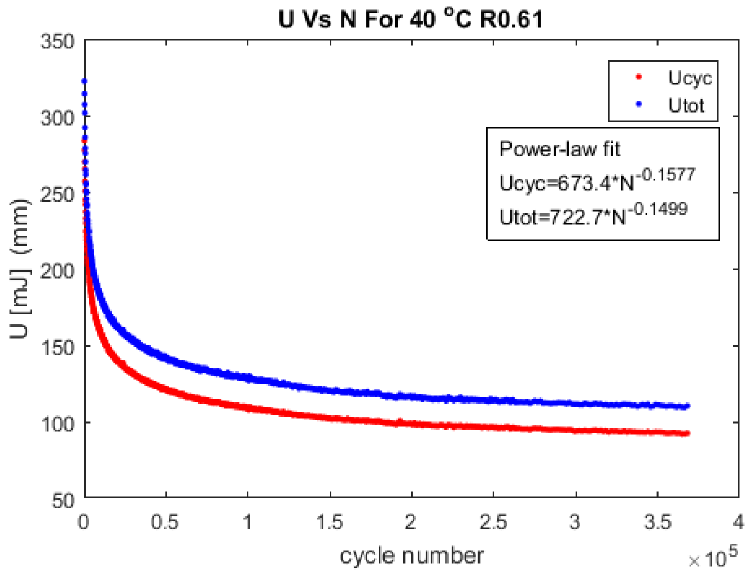

Figure 3 U_{cyc} and U_{tot} plotted against N for specimen 40 R0.61

First derivative of the power law curve fitting equations as mentioned in Figure 3 gives $-dU_{cyc}/dN$ and $-dU_{tot}/dN$. Same steps were carried out for the data of all tests.

Name of the test data gives the information of the test temperature and the applied R-ratio, For example "40 R0.61" means the specimen that was tested at 40℃ and at R-ratio 0.61. In some cases, when same test was repeated, letter 'R' has been added at the end of the data/test name for example "-55 R0.036 R" means this is test was repeated at -55℃ and R= 0.036.

Width of each specimen was measure using a calliper. Table-1 shows the width of each specimen.

Table 1 Specimen width

Test Name	Specimen width 'b' (mm)	Test Name	Specimen width 'b' (mm)
-55 R0.036	24.99	RT R0.61	25.01
-55 R0.29	24.98	40 R0.036	24.98
-55 R0.61	24.99	40 R0.29	24.97
-55 R0.61 R	24.98	40 R0.61	24.97
-20 R0.036	25.01	60 R0.036	25.01
-20 R0.036 R	24.98	60 R0.036 R	25.01
-20 R0.29	24.95	60 R0.29	25.02
-20 R0.61	24.99	60 R0.61	24.98
-20 R0.61 R	25.02	80 R0.036	25
ZeroR0.036	25.02	80 R0.29	25.01
ZeroR0.29	25.02	80 R0.61	25.01
ZeroR0.61	25.02	80 R0.61R	25.01
RT R0.036	25.01		
RT R0.29	24.98		

References

Pascoe, J., Alderliesten, R. & Benedictus, R., 2016. Characterising resistance to fatigue crack growth in adhesive bonds by measuring release of strain energy. *Structural Integrity Procedia. (Submitted for Publication).*

Rans, C., Alderliesten, . R. & Benedictus, R., 2011. Misinterpreting the results: how similitude can improve our understanding of fatigue delamination growth. *Compos Sci Technol,* Volume 71, pp. 230-238.