This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

Signed:
Date:

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ABSTRACT

The first aim of this project was to characterise the cure of several epoxy resin systems using dielectric spectroscopy, DSC, FT-IR spectroscopy and rheology measurements. It was hoped to build up an understanding of the cure process and correlate the results produced by the different methods to establish whether dielectric spectroscopy can be used to monitor the cure of epoxy resins in the field without specialist training in interpretation of the results. The second aim was to quantify moisture ingress through gravimetric measurements and dielectric spectroscopy.

Although in certain systems a close correspondence between the different methods is observed this can not be generally assumed to be true in all cases. It would appear that differences can be observed which reflect the way in which the physical properties changes are connected to the controlling molecular processes. The dielectric measurements, although sensitive to the cure process, exhibit activation parameters which can be significantly different from those obtained by other methods. The differences observed can be rationalised on the basis of the influence of the short range molecular mobility of the matrix on the electrical properties.

For the water ingress study, the dielectric studies indicate the type of water and its distribution whereas the gravimetric data indicates how much moisture is absorbed. Using a combination of the two measurement methods it is possible to obtain a greater insight into the nature of the moisture uptake than using either alone.

ABBREVIATIONS

ACLAIM	Advanced composite life assessment and integrity management
BDMA	Benzyldimethylamine
DDS	Diaminodiphenylsulphone
DGEBA	Diglycidyl ether of bisphenol A
DGEBF	Diglycidyl ether of bisphenol F
DICY	Dicyandiamide
DMTA	Dynamic mechanical thermal analysis
DSC	Differential scanning calorimetry
EEW	Epoxy equivalent weight
EMM	Epoxy molar mass
EPA	phthalic anhydride
FT-IR	Fourier transform infra-red (spectroscopy)
IPD	Isophoronediamine
LVDT	Linear variable differential transducer
NIR	Near infra-red
TETA	Triethylenetetramine
TTT	Time-temperature-transformation (diagram)

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