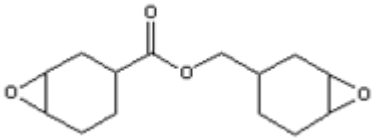
CDS solutions

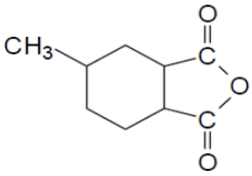
APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

Quantitation of Epoxy to Hardener Ratios in a Cycloaliphatic Epoxy

Although many common epoxy resins are formulated using Bisphenol A, aliphatic, especially cyclyhexyl compounds, are also used. The epoxies shown here were formulated with varying amounts of 3,4-Epoxycyclohexylmethyl 3,4- epoxy cyclohexane carboxylate, shown below:



and hardened using methylhexahydrophthalic anhydride (MHHPA), which has the structure:



The samples used epoxy to hardener ratios of 0.50, 0.66 and 1.00. When pyrolyzed, each sample produced a pyrogram like the one shown in Figure 1, with most of the components eluting as three peaks at about 14 minutes. Figure 2 shows an expanded view of the epoxies, with epoxy to hardener ratios of 1:2 and 1:1.

Ascribing the first peak to the epoxy resin and the third peak to the hardener, peak area ratios were plotted against the relative amounts of the constituents. This produced a linear graph for the range of constituent ratios, shown in Figure 3.

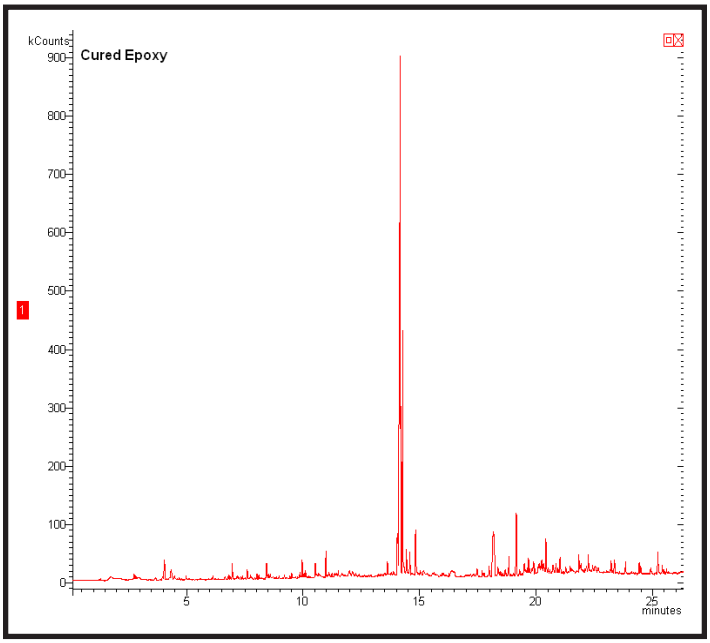


Figure 1. Pyrogram of epoxy at 750°C.

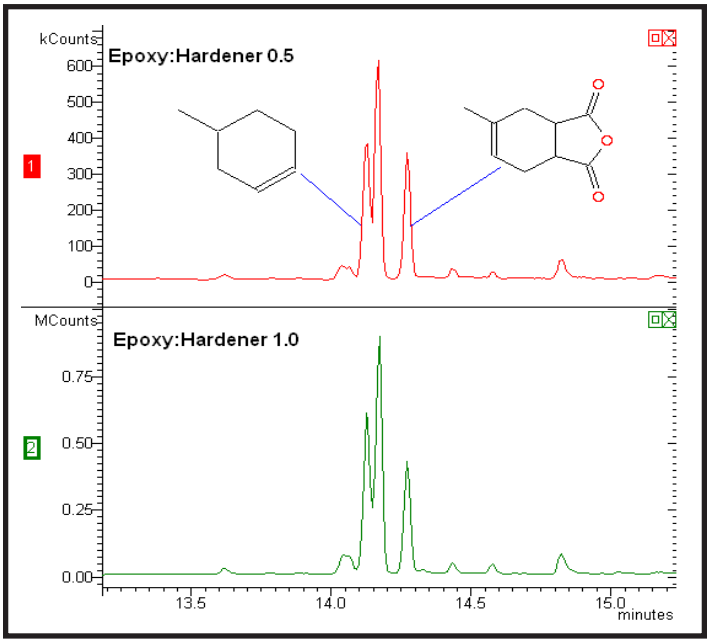


Figure 2. Expanded view of pyrogram.

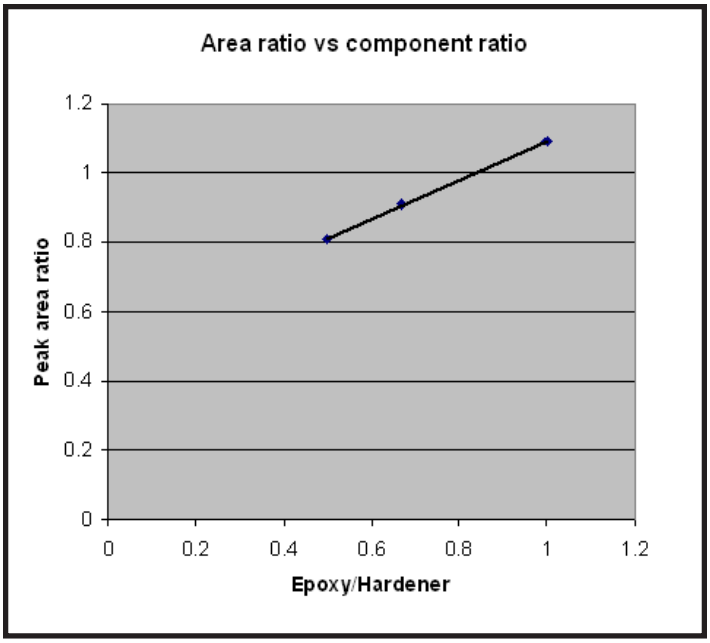


Figure 3. Graph of peak area ratio vs component ratio.

Experimental Parameters

All samples were pyrolyzed using a CDS Pyroprobe 5200 equipped with a Tenax trap.

Pyroprobe

Pyrolysis:	750°C for 15 seconds
Interface:	325°C for 4 minutes
Carrier flow:	30 ml/min

GC/MS

Column:	30 m x 0.25 mm 5% phenyl MS
Carrier:	Helium
Split:	75:1
Oven program:	
	40°C for 2 minutes
	10°C/minute to 325°C

FOR MORE INFORMATION CONCERNING THIS APPLICATION, WE RECOMMEND THE FOLLOWING READING:

H. Nakagawa and S. Tsuge, Studies on Thermal Degradation of Epoxy Resins by High-resolution Pyrolysis-Gas Chromatography, J. Anal. Appl. Pyrolysis 7 (1987) 113.

Additional literature on this and related applications may be obtained by contacting your local CDS Analytical representative, or directly from CDS at the address below.

CDS Analytical, LLC 465 Limestone Road, P.O. Box 277, Oxford, PA USA 19363-0277 PH: 610 932 3636 FX: 610 932 4158