Application Note: 31043

High Energy Resolution Monochromatic XPS Spectra of Polyethylene

Key Words

- Surface Analysis
- High Resolution
- High Sensitivity

Thermo Scientific ESCALAB 250 with its microfocused monochromator and coaxial charge compensation combines high energy resolution with high sensitivity. This combination is particularly important in the analysis of polymers where there is the risk of damage to the sample surface during analysis. The peak fitting routine on the *Avantage* data system is used to reveal the vibrational fine structure in the spectrum.

The high sensitivity lens allows the analysis of weaker features in the spectrum with short acquisition times. This means that the analyst can now make use of valence band spectra to distinguish very similar polymeric materials.

ESCALAB 250 utilizes a 500 mm Rowland circle monochromator to produce a small X-ray spot with minimum energy spread. When combined with the lens and coaxial charge compensation system, the very highest energy resolution and sensitivity may be obtained from polymers and other insulating materials.

The C 1s spectrum shown was obtained from clean polyethylene film, using the microfocused monochromator. The total acquisition time for the spectrum was 40 seconds. The FWHM of the total peak is 0.79 eV, but the peak shows asymmetry attributed to vibrational fine structure (Figure 1). Peak fitting has been used to resolve the separate components which each have a FWHM of 0.58 eV.

Valence band spectra can be used to 'fingerprint' otherwise similar polymers. The valence band is a relatively weak feature and traditionally acquisition times have extended over several hours. The Figure 2 spectrum shows the valence band from polyethylene, acquired in only 3 minutes 20 seconds.

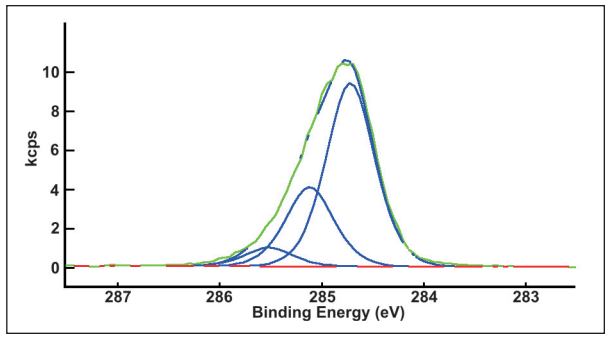

Figure 1: C 1s spectrum of Polyethylene

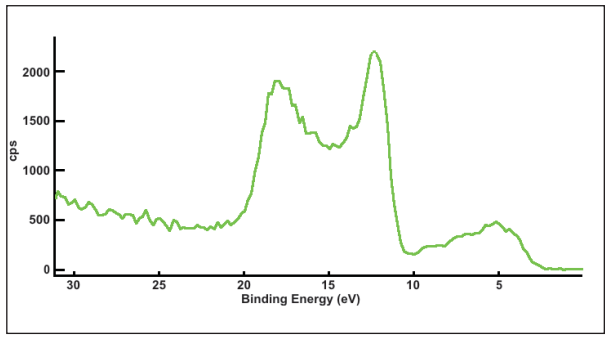

Figure 2: Valence band spectrum of Polyethylene

Reference

G. Beamson, D.T. Clark, J. Kendrick, D. Briggs.J. Elec. Spec. & Rel. Phenom. 57 (1991) 79

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