32
doi:10.1017/S1431927610059076
Microsc. Microanal. 16 (Suppl 2), 2010
© Microscopy Society of America 2010

Advanced Surface Characterisation with X-ray Photoelectron Spectroscopy

P. Mack, T. S. Nunney, R. G. White, J. Wolstenholme, A. E. Wright

Thermo Fisher Scientific, The Birches, Imberhorne Lane, East Grinstead, West Sussex, RH19 1UB, UK.

The chemistry and structure of material determines its interactions with other materials. In various applications ranging from biomedical devices to metals and sensors the composition of the surface is critical. Advanced techniques are required to fully characterise the surface that are not present in the armoury of the microscopist. X-ray Photoelectron Spectroscopy (XPS) is a quantitative chemical analysis technique that probes only the outer few nm of the surface, enabling the analyst to characterise this important area of the material or device.

XPS, angle resolved XPS (ARXPS) and sputter profiling are methods that are ideally suited to the determination of the surface chemistry and the way in which that chemistry changes in the surface and near-surface region. XPS is the only analytical method providing quantitative elemental and chemical information with extremely high surface sensitivity and is ideal for comprehensively characterising the elemental composition and chemical bonding states on surfaces and interfaces. XPS spectroscopic imaging, in which spectral data are acquired with some degree of lateral resolution, allows the identification of both spatial and chemical variations in materials. The expansive data sets that result from spectroscopic imaging experiments must be treated with powerful software algorithms, to extract high levels of chemical information with a minimum of acquisition time.

XPS solutions to structural and chemical problems are discussed in this presentation. Such analyses demonstrate the importance of small-scale structure on the integrity of a polymer blend (as shown in figure 1), show the consequences of corrosion/dissolution of metallic and polymeric surfaces, and illustrate the nature of bonding failures. The effectiveness of XPS analyses, and the intensive, automated data refinement processes required to access the maximum information from them, are shown for each of these examples.

https://doi.org/10.1017/S1431927610059076 Published online by Cambridge University Press

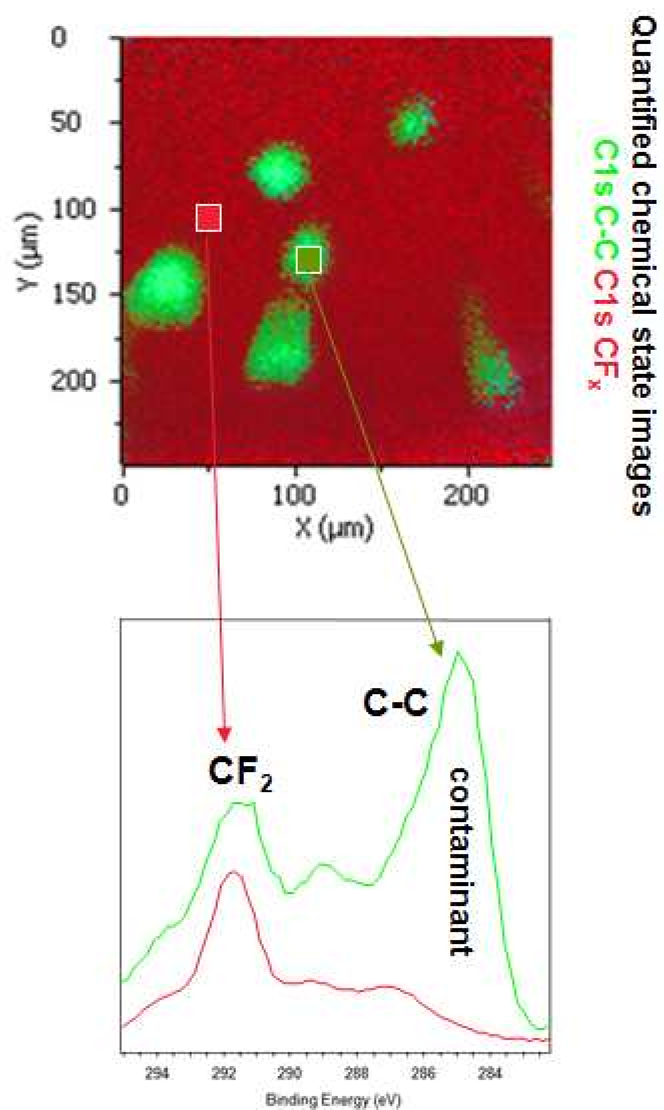

Fig. 1. XPS C1s image of contaminant inclusions in a fluropolymer matrix. Retospective spectra from 6 µm areas on the matrix and a contaminant particle are also shown.

https://doi.org/10.1017/S1431927610059076 Published online by Cambridge University Press