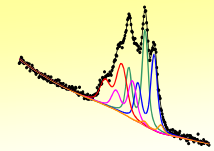




Batch Processing – from the Measured Spectrum to the High Quality Presentation Using the XPS Software UNIFIT 2009 only

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Case study: Sputter depth profile on Si₃N₄ films Problem: O and N distributions with respect to depth

Presentation of survey spectra

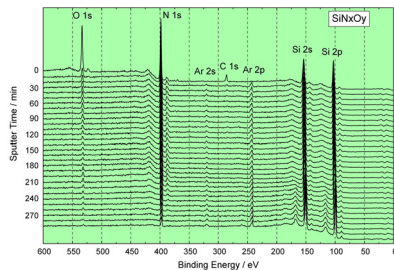


Fig. 1. Plot 3D-Waterfall 0°: surveys SiNxOy

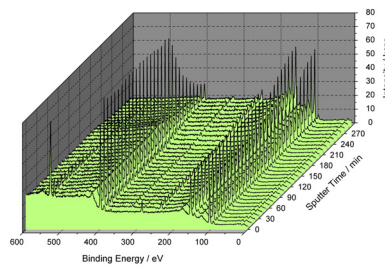


Fig. 2. Plot 3D-Waterfall 45°: surveys SiNxOy

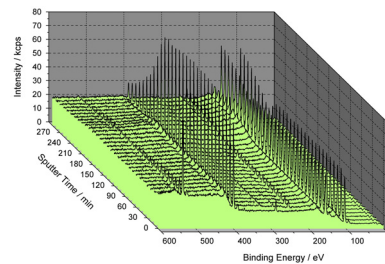


Fig. 3. Plot 3D-Waterfall -45°: surveys SiNxOy

Analysis and presentation of narrow scans

O 1s

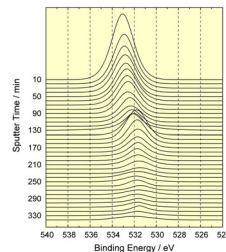


Fig. 4. Plot 3D-Waterfall 0°: O 1s

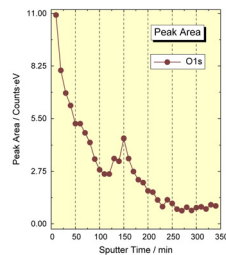


Fig. 6. Parameter Plot: Peak areas O 1s

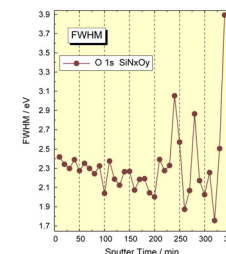


Fig. 8. Parameter Plot: FWHMs O 1s

N 1s

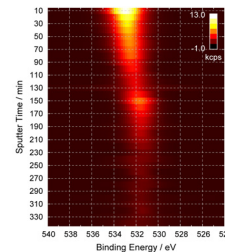


Fig. 5. Plot 3D-Colour Profile: O 1s

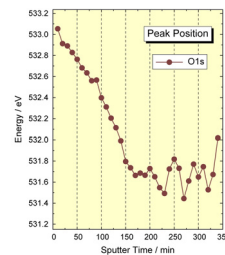


Fig. 7. Parameter Plot: Peak positions O 1s

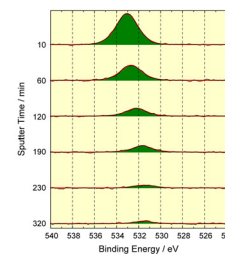


Fig. 9. Plot 3-D Waterfall 0° Plus: Peak fit O 1s

N 1s

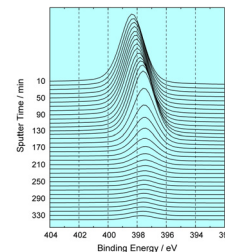


Fig. 10. Plot 3D-Waterfall 0°: N 1s

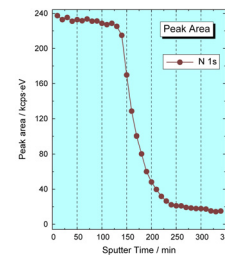


Fig. 12. Parameter Plot: Peak areas N 1s

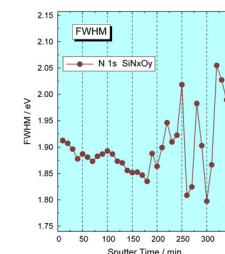


Fig. 14. Parameter Plot: FWHMs N 1s

Si 2p

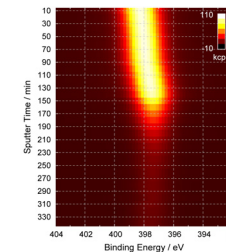


Fig. 11. Plot 3D-Colour Profile: N 1s

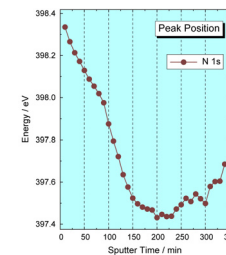


Fig. 13. Parameter Plot: Peak positions N 1s

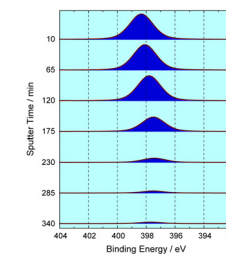


Fig. 15. Plot 3D Waterfall 0° Plus: Peak fit N 1s

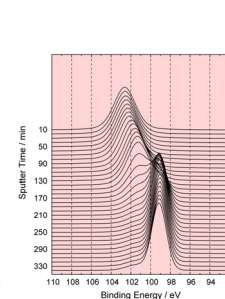


Fig. 16. Plot 3D-Waterfall 0°: Si 2p

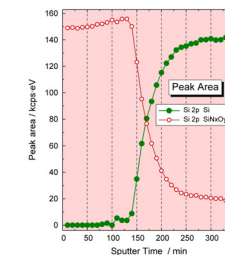


Fig. 18. Parameter Plot: Peak areas Si 2p

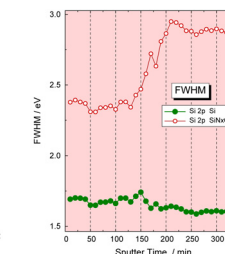


Fig. 20. Parameter Plot: FWHMs Si 2p

Si 2p

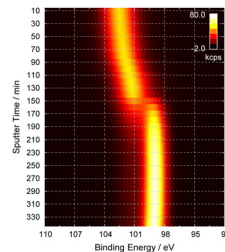


Fig. 17. Plot 3D-Colour Profile: Si 2p

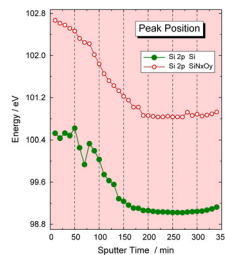


Fig. 19. Parameter Plot: Peak positions Si 2p

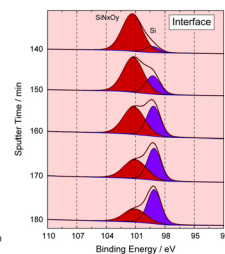


Fig. 21. Plot 3-D Waterfall 0° Plus: Peak fit Si 2p

Quantification

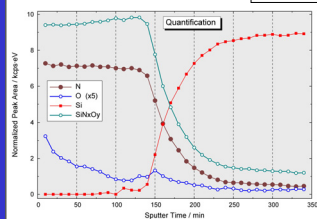


Fig. 22. Parameter Plot: Quantification of Si 2p, O 1s, N 1s

Batch peak-fitting results may be transferred directly to the quantification routine. The quantification results

1. peak area A
2. normalised peak area $A_N = A/(\sigma\lambda T)$ (see Fig. 22)
3. atomic percentage with respect to the
 1. batch parameters (e.g. sputter time)
 2. window numbers
 3. manually defined parameters.

σ – Ionisation Cross Section
 λ – Inelastic Mean Free Path
T – Transmission function

Batch procedures

Processing:

1. Simultaneous displaying and processing of up to 100 windows,
2. including all spectrum modifications, e.g. reduction, differentiation, smoothing, etc.,
3. normalisation to maximum, minimum, manually defined value or intensity at a certain energy,
4. peak fit using different
 - model functions (product, sum or convolution),
 - peak species (singlet peaks or doublet peaks),
 - fit parameters (absolute or relative),
5. integration of a fitable background consisting of
 - polynomial 3rd degree,
 - Shirley background,
 - Tougaard background (with variable loss functions).

Presentation:

1. Plot 3D-Waterfall 0°: Plot of spectra (see Fig. 1) or sum curves of the peak fit (see Fig. 4, 10, 16) with a viewing angle of 0°,
2. Plot 3D-Waterfall 45°: Plot of spectra (see Fig. 2) or sum curves with 45° viewing,
3. Plot 3D-Waterfall -45°: Plot of spectra (see Fig. 3) or sum curves with -45° viewing,
4. Plot 3D-Colour Profile: Plot of the intensity of spectra or sum curves as brightness (see Fig. 5, 11, 17),
5. Plot 3D-Waterfall 0° Plus: Plot of fitted spectra (see Fig. 9, 15, 21),
6. Plot Fit Parameter: Plot of fit parameters, e.g. peak position (see Fig. 7, 13, 19), peak area (see Fig. 6, 12, 18), FWHM (see Fig. 8, 14, 20), peak height, etc.,
7. Parameter Plot of the quantification results, e.g. peak area, normalized peak area (see Fig. 22) or atomic percentage.