

Guidelines for sample handling

This text deals with the treatment of samples prior to a surface analysis (meant are methods of analysis with information depths of a few nanometers). It is intended to illustrate the problem how sample surfaces might be contaminated by handling or sample packaging. We show some simple solutions, applicable in your own laboratory or at the production line.



This text relates to the handling of samples for the following analysis methods:

- Auger Electron Spectroscopy (AES)
- Photoelectron spectroscopy (XPS / ESCA)
- Secondary Ion Mass Spectrometry (SIMS)
- Atomic force microscopy (AFM)

There is no claim to be exhaustive.

Why this guide?

The analytical techniques mentioned above typically have a surface sensitivity of only a few nanometers. This high surface sensitivity is of high value for the analysis of many surface and interfacial specific issues. On the other hand, these techniques are therefore also susceptible to unwanted contamination of surfaces.

therefore the correct treatment and preparation of samples is extremely critical for the validity of surface analytical investigations. Improper use of the samples can easily lead to contamination of the sample surface and thus to distorted analysis results.

This guide is intended to give assistance with regard to the sampling and packaging of specimens for transport.

Notes on Sampling

When taking samples you should consider some facts:

- 1) Samples should not be touched with bare hands. Touching the surface to be analyzed has to be avoided or at least should be reduced to an absolute minimum.
- 2) The contact of the sample surface to be tested with chemicals such as solvents, cleaning agents, gases (eg. As compressed air) or fumes, metals, paper towels, duct tape (e.g. "Tesa"), clothing, tools, packaging materials or the walls of containers used for packaging must be avoided whenever possible.
- 3) In the case of larger samples it may be necessary to cut out a part. When choosing a representative sample you should keep in mind that inhomogeneity on larger samples occur frequently.
- 4) If the sample may contain hazardous substances, the corresponding data sheets should always be sent along with the sample.
- 5) All specimens should be clearly identified. This should never be made nearby the region to be analyzed. If possible mark the samples on the rear side (not to be analyzed side).

Packing of samples

For sending samples by mail or express services you have to pack the specimens. You want to be sure that this packing does not influence the analytical results obtained after the samples arrived. Therefore the Packaging should ensure that the sample surface is not contaminated during transport e.g. by particles, liquids or gases.

Possible sources of contaminations are additives such as plasticizers or lubricants, which emerge from plastics and can be transferred from the packaging to the sample surface. Lubricants are for example mostly used in the production of PE bags. If samples are send out wrapped in PE bags this lubricants can often be detected on the sample surface.

In general the contact to packaging material to the sample surface to be analyzed should be avoided if possible or even minimized.

Some proved proposals for packaging

For many samples, small glass containers can be used. The inner diameter of the vials should be chosen slightly larger than the specimen size so that the sample can be placed in the vials with minimized contact to the walls. However be sure that the lid may not be a source of contamination. When in doubt, the glass container can be sealed with fresh aluminum foil.

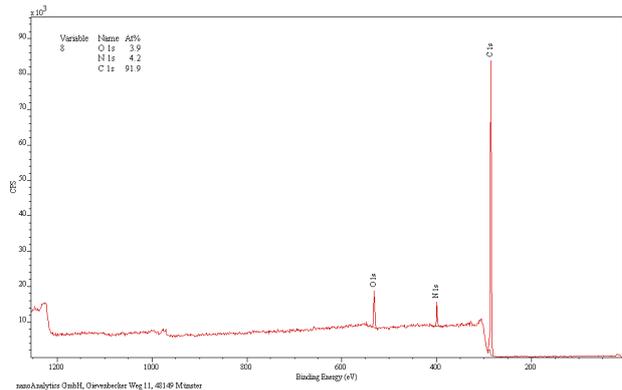
If glass vials are not available, vials or Petri dishes made from polypropylene (PP) or polyethylene (PE) may be used. However, it must be ensured that the analyzed sample surface can not come into contact with the plastic. Under certain circumstances, the sample has to be carefully fixed by means of a double-sided adhesive tape to the not to be analyzed page.

If suitable containers are not available the sample may also wrapped using a fresh piece of aluminum foil. The foil should be of food quality. Generously loosely wrap the samples in the foil. If even aluminum foil is not available a fresh white sheet of writing paper may also do the job.

Example of typical contamination by a PE bag

Pure polyethylene (PE) consists only of the elements carbon and hydrogen. Nevertheless in real life, most polymers contain additives to modify the materials properties. For example to ensure easier processing of the polymer, reduce adhesion in the injection mold or to improve the lifetime of the product.

The XPS analysis of the inside surface of a polyethylene bag is shown in the following image:



In addition to the expected elements oxygen and nitrogen are detected. A details analysis shows that the surface of the bag is covered completely with an amide compound. Such compounds are typically added as a lubricant during processing the polymer.

A washing process the polyethylene bag with acetone removes this plaque. However, if the sample is transported in such bags, these additives can be transferred to the sample surface and influence the result of surface analytical investigations.

If you have further questions regarding wrapping or posting your samples we will be happy to assist you. Just contact us.

Further reading:
- ASTM E 1829