

## SPINNING FILTER ANALYSIS

### Learning from filter residues

#### TASK

Impurities in the polymer always lead to spinning problems in man-made fiber production. Although filters retain many (especially larger) particles, smaller or gel-like impurities find their way through the filter. If a lot of particles are retained, there is also an early increase in pressure and the filter has to be changed prematurely. The polymer is cleaned by the filter, but the cause remains unknown.

#### LÖSUNG

Analytik Service Obernburg uses microscopic techniques on cross-sections to track down the filter residues.

#### Industries

Chemical fiber  
plastics processors

#### Analysis goals

Process optimization  
Product optimization  
Damage analysis

#### Materials

Filter screens  
Contaminated  
polymers

#### Analysis methods

Light microscopy  
Scanning electron  
microscopy  
(REM-EDX)

#### Supplementary methods

FTIR spectroscopy

#### Related questions

Solids in liquids  
Inclusions



### **EXAMPLE - LIGHT MICROSCOPIC ANALYSIS**

After polishing the cross-section, the filter wires can be seen in reflected light, but the residues are difficult to recognize (Fig. 1). By using polarized light, the inherent color of the residues is obtained. The soot appears black here. Fluorescence can often be used to detect degraded polymer, which can be pushed through the openings of the filter if sufficient pressure is built up. The color can be correlated with the severity of the damage.

### **EXAMPLE - MATERIAL IDENTIFICATION WITH SCANNING ELECTRON MICROSCOPY / EDX**

Material identification of the residues is carried out using X-ray analysis spectra (EDX) in the scanning electron microscope (SEM). This is sufficient for simple residues, e.g. mineral impurities. However, if the structure is more complicated, element distribution images can help to understand the structure. In the above case (Fig. 2), the residue originates from the wall of the reaction vessel in which the polymer was synthesized, whereby different types of polymer were produced in succession in the same vessel. Manganese phosphate and antimony are typical catalysts in polyester production, while titanium dioxide is used as a white pigment.

### **ADVANTAGE**

The process described allows filter residues to be visualized and identified. This allows the causes of contamination to be analyzed and processes to be optimized. The impurities are concentrated through filtration. In a modified form, the process is also suitable for separating and analyzing solids from liquids. Analytik Service Obernburg also has extensive expertise in other microscopic and spectroscopic methods.

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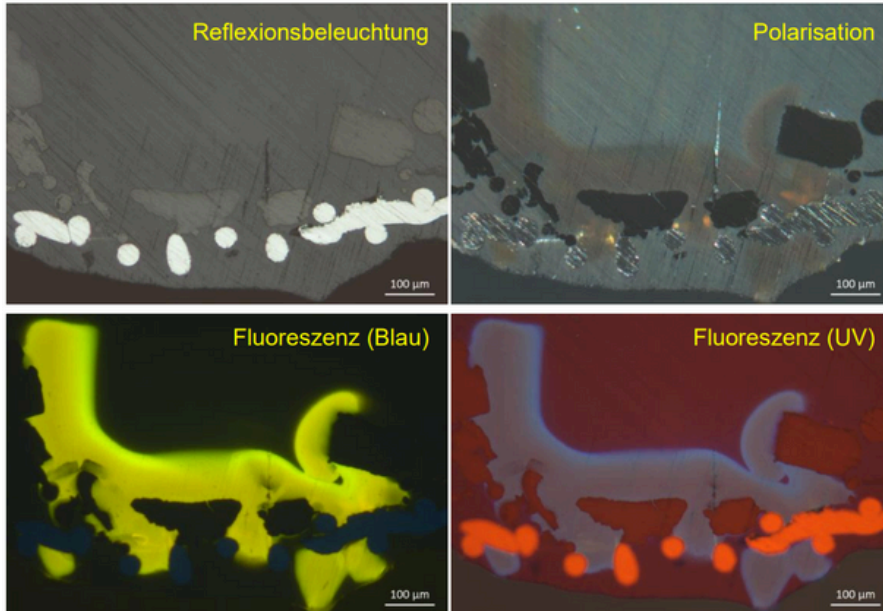


Fig. 1: Polished screen cross-section with soot particles (black) and degraded polymer (fluorescence images)

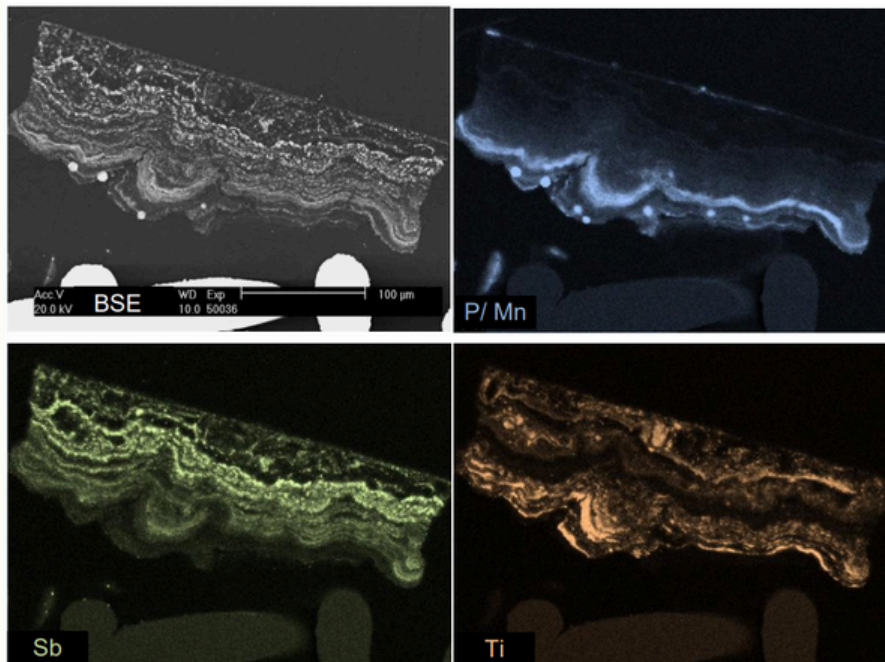


Fig. 2: Material contrast (BSE) and distribution images of selected elements