

LACQUER ADHESION

TASK

Complaints about painted or coated plastic components often involve inadequate wetting or insufficient adhesion of the paint or coating. This is often due to extremely thin layers of contamination or insufficient surface energy in the interface layer, both of which prevent good adhesion. Finding the cause requires extremely surface-sensitive methods.

SOLUTION

In such cases, Analytical Services Obernburg uses ESCA technology (Electron Spectroscopy for Chemical Analysis). With very high surface sensitivity (approx. 5 - 10 nm information depth), this provides clear indications of the chemistry at the surface or interface. It is precisely this area that is decisive for good adhesion.

Industries

Paint manufacturer
Painting system
suppliers

Analysis goals

Damage analysis

Materials

Painted components
Paints

Analysis method

Light microscopy
ESCA/XPS

Related questions

Adhesion problems
with bonding



EXAMPLE - PAINT DEFECT (WETTING PROBLEM)

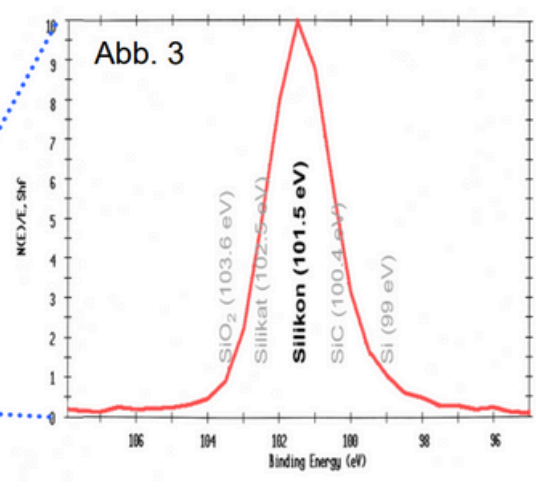
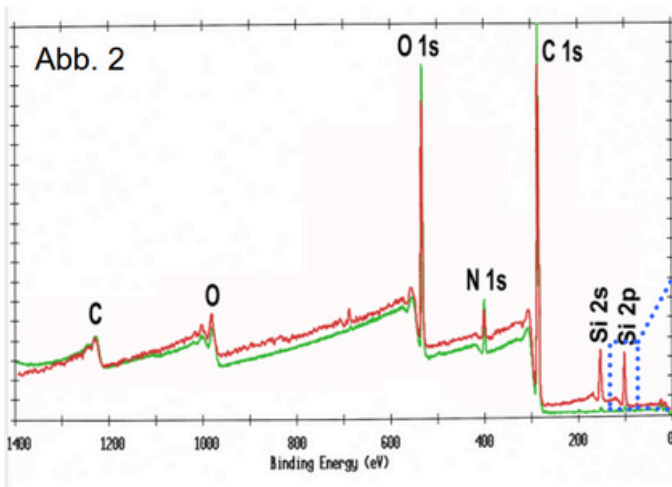
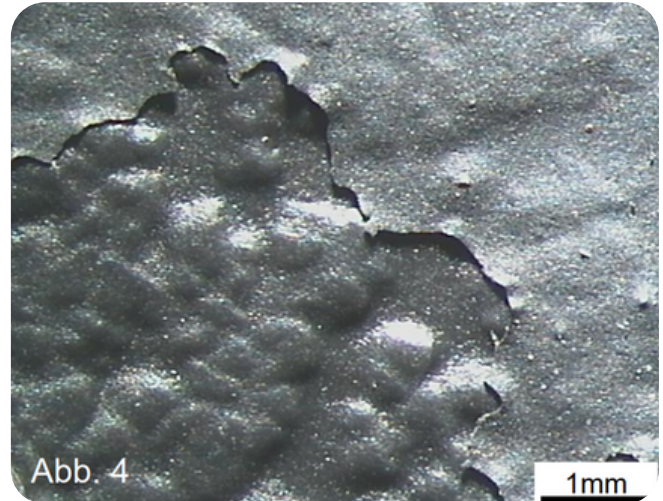
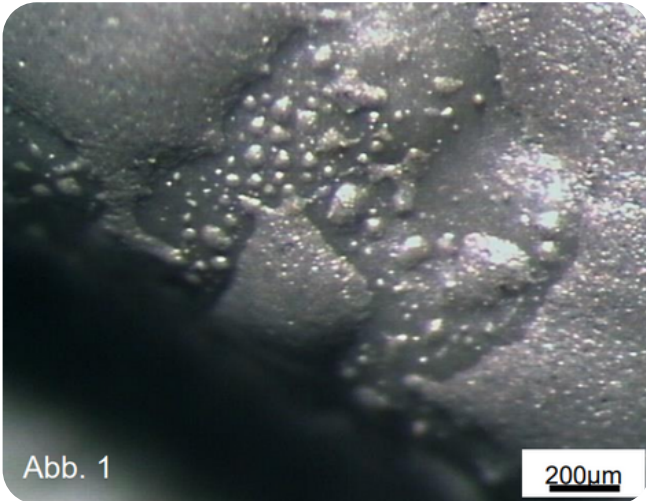
Poor wetting of a plastic component is indicated by the formation of droplets in the paint (Fig. 1). The ESCA overview spectrum in Fig. 2 shows a high silicon concentration (8-14 at%) in the defect area (red spectrum). Based on the Si2p binding spectrum (Fig. 3), the silicon can be clearly assigned to a silicone oil. After cleaning the surface with acetone, the silicone oil disappeared (green spectrum in Fig. 2). Silicone contamination as the cause of the defect is thus clearly proven.

EXAMPLE - REDUCED PAINT ADHESION

The dispersion coating on an injection-molded plastic part became detached over a large area (Fig. 4). The surface energy of the plastic surface was increased by activation (oxidation) before painting in order to ensure good adhesion of the paint. Comparative measurements on an untreated surface and surfaces with different levels of activation (Tab. 1) show that the detachment of the paint from the component was caused by inadequate or incorrect pre-treatment of the surface (activation).

ADVANTAGE

The method described allows visualization and analysis of the coating structure, possible defects and measurement of the local coating thickness. It requires a great deal of experience and skill in micropreparation and damage analysis. The SEM-EDX method is also suitable for many other characterizations, such as soiling on surfaces.



	C [at%]	O [at%]	N [at%]
unbehandelte Oberfläche	98	1	1
normale Oberflächenaktivierung	95	4	1
starke Oberflächenaktivierung	90	8	2
Oberfläche unter Ablösung	99	1	0

Tabelle 1:
Elementkonzentration an der
Grenzfläche