

PLASTICS AND ELECTRONICS

Failure of plug and circuit board after storage in damp conditions

TASK

After an electronic component had been stored in damp conditions at a high temperature, leakage currents occurred on the circuit board when energized.

SOLUTION

A light microscopic examination at Analytik Service Obernburg showed clear discoloration of connector pins (Fig. 1), solder contacts and circuit board (Fig. 2).

ADVANTAGE

The method described allows a problem-solving-oriented damage analysis for various defect patterns. The element composition in the defect area allows conclusions to be drawn about the cause.

Industries

Automotive suppliers
Medical technology
Plastics processors

Analysis goals

Failure analysis Process optimization

Materials

Circuit boards and connectors

Analysis method

Light microscope
Scanning electron microscope

Supplementary methods

IR spectroscopy
X-ray fluorescence
Climate storage
Initial sample testing

Related questions

Defect analysis
Contamination



SOLUTION

The optically altered areas were analyzed using scanning electron microscopy and energy-dispersive X-ray analysis (EDX).

While clear corrosion involving bromine could be detected on the positively charged pin (Fig. 3), the discoloration of the circuit board next to the grounded pin contains significant amounts of potassium (Fig. 4). Based on the measurement results, it was assumed that alkali halides were added to the plastic of the connector to achieve heat resistance, which were dissolved out of the polymer by temperature and humidity. The applied voltage caused the ions to migrate, which in turn caused the chemical changes. An examination of the plastic and simulations confirmed the assumption.

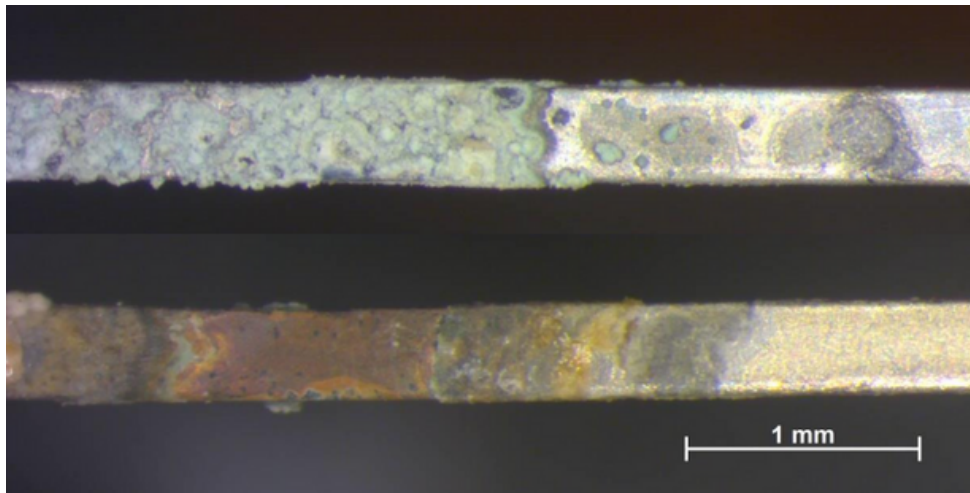


Fig. 1: Discoloration of the connector pins after disassembly.

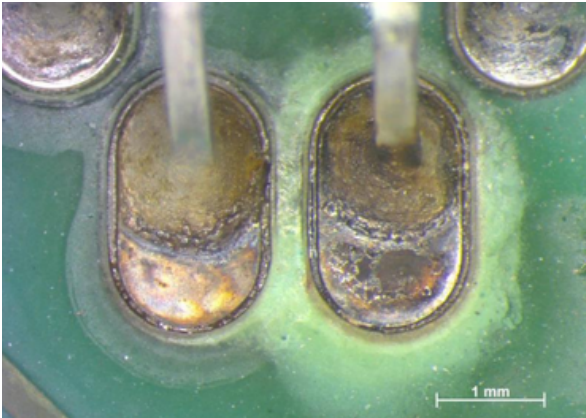


Fig. 2: Discoloration of solder contacts and circuit board

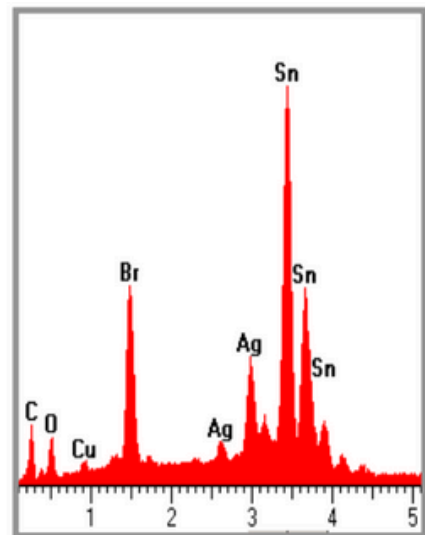
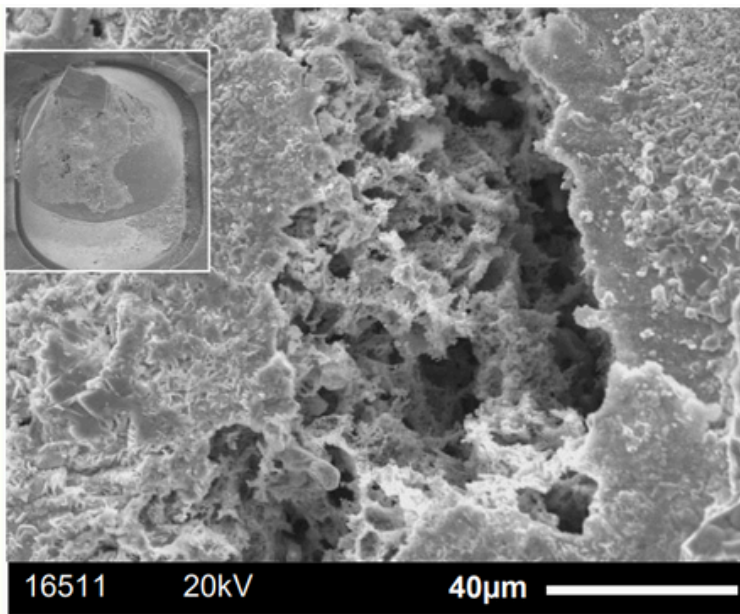


Fig. 3: Chemical attack of the solder with indications of bromine at the positive pole

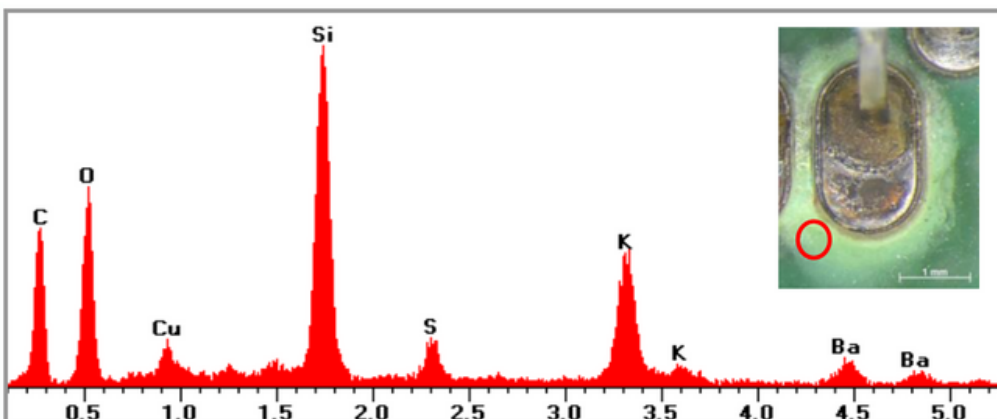


Fig. 4 Accumulation of potassium in the protective coating around the earthed pin