

Damage and material analysis

Fractography

In order to clarify the cause of a damage, learn from it and initiate optimal preventive measures, a systematic damage investigation is necessary. Various methods of investigation in materials science provide important information to be able to deduce the cause and sequence of the failure. These include fracture surface analysis (fractography), which aims to interpret the fracture surface.

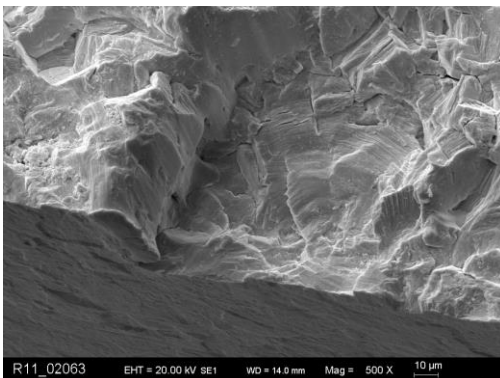


Scanning electron microscope (SEM) with EDX analyser

The use of the SEM is essential for proper microscopic examination of a fracture surface. In combination with EDX (energy-dispersing X-ray spectroscopy), it is also possible to determine the chemical composition of interesting fracture details (inclusions, precipitates, coatings, etc.).



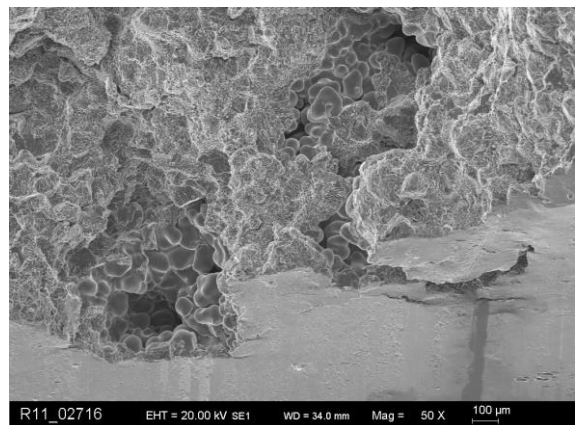
Broken compression spring, spring steel
A local surface defect led to crack formation



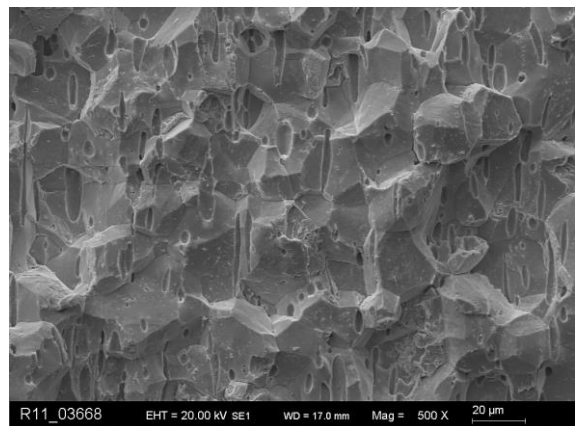
Transcrystalline vibration fracture in a titanium alloy

History and benefits

- The beginnings of fracture assessment were limited to visual and light microscopic methods.
- With the introduction of scanning electron microscopy, the possibility was created to view fracture surfaces directly and with much better depth of focus, quasi three-dimensionally.
- When damage occurs, the material serves as a kind of data carrier, which stores the damage history in structure, microstructure and fracture morphology as fine as a hair.
- The fractographic examination plays a central role in this, because component failure very often ends in a fracture.
- By evaluating characteristic fracture features (macro- and microscopic), indications of crack initiation, crack propagation, mode of loading etc. can be read out.
- From this information, conclusions can be drawn about
- Derive the cause of breakage or damage.



Hole in light metal lever, cast aluminium alloy
The micro blowhole caused the component to fail.



Hydrogen embrittlement in a steel ball joint

