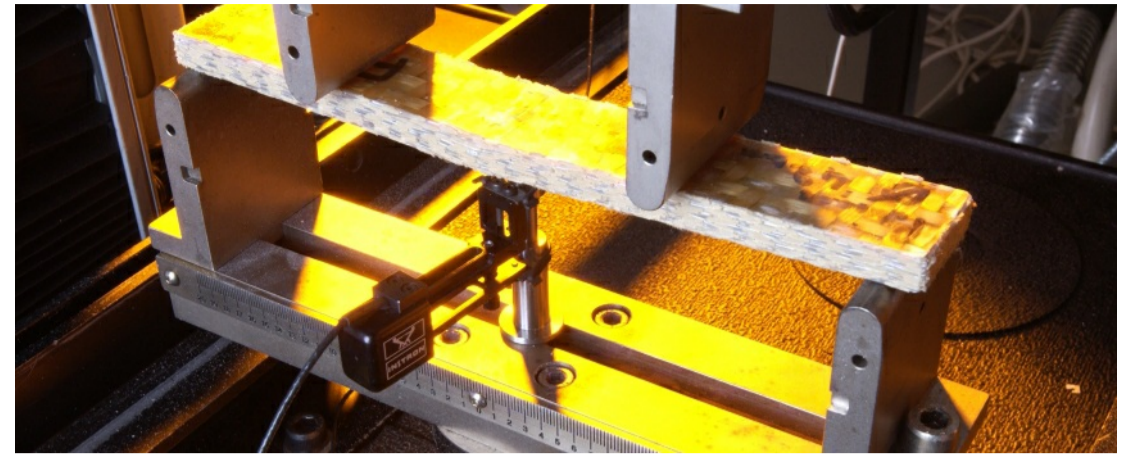


# TESTING AND ANALYSIS OF POLYMER, OMC AND CMC COMPOSITE MATERIALS

Multidisciplinary expertise for implementing alternatives to metallic materials



## Your expectations

As part of the **implementation or replacement of metallic materials with polymers, elastomers, or composite materials (OMCs and CMCs)**, it is essential to accurately characterize and qualify material behaviour to ensure their successful integration into your products and structures.

Testing and analytical investigations are key to validating the suitability of materials against functional requirements, understanding their performance under real operating conditions, and ensuring long-term durability, particularly in harsh service environments.

During the design or development of your products, you may need to:

- **Characterize and qualify** plastic materials, elastomers, and organic- or ceramic-matrix composites under demanding environmental conditions, including high temperatures, deep cryogenic environments, aggressive fluids, pressure, UV exposure, and more.
- **Validate material performance** against the functional specifications of components or structures incorporating these materials.
- **Identify the root causes of failures** occurring during manufacturing, testing, or in-service operation.

## Our solutions

- **Design test plans and test configurations** tailored to address all functions defined in the technical specifications, or to support failure root-cause investigations.
- **Develop testing protocols** according to the materials involved and the expected performance requirements
  - Standardized testing
    - Mechanical and physico-chemical testing
    - Standard and advanced non-destructive testing (NDT)
  - Custom testing
    - Determination of material behaviour laws using innovative characterization techniques
    - Custom-designed test rigs and test benches
    - Multi-physics testing
    - Multi-instrumented testing
- **Service life assessment, accelerated ageing testing, and evaluation of property evolution** throughout the product's operational lifetime
  - Environmental stresses (fluids, climatic conditions, UV exposure, etc.)
  - Mechanical loading (creep, fatigue, etc.)

- Use of advanced simulation tools to establish correlations between numerical predictions and experimental results
- **Material health assessment**
  - Destructive Controls
    - Micrographic examinations.
    - Fibre content measurement
    - Porosity assessment
  - Non-destructive Controls
    - Computed tomography (CT)
    - Radiography
    - Infrared thermography
    - Ultrasonic testing
- **Fracture surface analysis**
  - Optical microscopy and Scanning Electron Microscopy (SEM).
  - Surface composition analysis.
  - Contamination and foreign matter investigations.

## Your benefits

---

**Cetim's multidisciplinary expertise** enables the integration of testing and characterization activities with advanced capabilities in design and redesign, failure analysis, assessment of harsh operating environments, and the development of multi-material components and structures (composites, plastics, elastomers, metals, etc.).

This comprehensive approach ensures optimized material selection, enhanced product reliability and accelerated innovation throughout the product development lifecycle.

