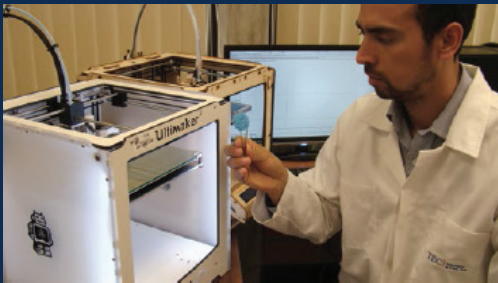
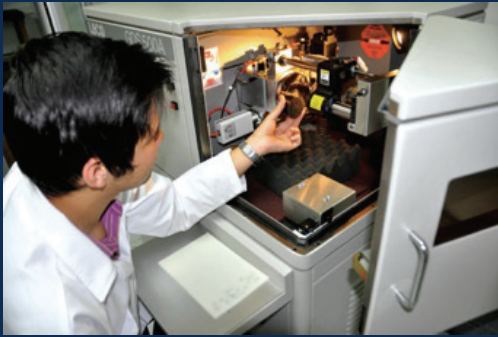


Our Research Center

CENTER FOR MATERIALS RESEARCH AND EXTENSION (CIEMTEC)
SCHOOL OF MATERIALS SCIENCE AND ENGINEERING
COSTA RICA INSTITUTE OF TECHNOLOGY (TEC)



FOR MORE INFORMATION

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This Center was founded in 1982 along with the Metallurgy program, in cooperation with the Italian government. The aim of this center was to give support and develop the activity of the metallurgical industry in Costa Rica. Now, the industry as well as our Center have evolved to include new materials and complex processes.

The Center covers three important areas: research, teaching and support to industry. In research, the center supports several projects:

- Application of non-destructive testing (NDT) for controlling the properties of porous and cellular materials (foams, sponges, etc.) for medical applications and radiation shielding.
- The characterization of defects and nanostructural alterations in the Nimonic 80A superalloy after the heat treatment and fatigue testing by transmission electron microscopy.
- Development of porous implants from biopolymers and hydroxyapatite by using 3D printing for bone implants.
- Development of nanostructured titanium alloys for biomedical applications by a severe plastic deformation (SPD) method known as High-Pressure Torsion (HPT) to achieve grain refinement to a nanostructure and therefore increase the mechanical strength above the levels of commercial alloys.
- Corrosion of concrete and degradation of its mechanical properties by CO_2 which permeates the porous and fracture structure of the concrete, which is a fundamental issue for establishing conditions of the concrete degradation.
- Polymeric material degradation by irradiation.
- Development of materials for biosensors and electrochemical sensors for detection of contaminants.

The services provided to the industry include heat treatment, material testing and characterization such as hardness, micrographic analysis, chemical composition, x-ray diffraction, tensile testing, axial and torsional fatigue, straining, cross section analysis, coating thickness, among others. Failure analyses are the most common, as well as material behavior in different conditions. Although destructive testing is often required, the support in NDT is special in our Center, covering from training to inspection in metallic bridges, boilers, oil containers, oil pipes, port platforms, as well as quality control of welded structures in general.

Teaching is strengthened by the experience in research and support to industry. In our Center, undergraduate and graduate students can improve their skills, with workshops and laboratories to gain the experience they need to deal with the medical industry. Our graduate students work in projects with our research professors to find solutions in medical applications.

- Personalized trans-tibia prosthetic design implementations with additive manufacturing.
- Bioactive hydroxyapatite coatings on biopolymers by atmospheric plasma spray.
- Collagen and organic nanoparticle extracts for biomimetic tissue applications.
- Characterization of biomedical alloys with special microstructures for medical devices.

In the framework of the Doctorate Engineering program, there are two important projects which are carried out in the CIEMTEC:

- Application of crystal engineering technology to improve the solubility of drugs, such as Irbesartan and Lovastatin
- Development of an in-vitro system to be adaptable in dynamic mechanical testing machines in order to generate biomechanical stimuli on scaffolds.

