

CATALOGUE OF PRODUCTS AND SERVICES

pucrs.br/ipr-en



PUCRS



SUMMARY

WHO WE ARE.....	<u>3</u>
QUALITY MANAGEMENT SYSTEM.....	<u>6</u>
CHEMICAL ANALYSES LABORATORY (LAQ).....	<u>10</u>
ROCK CHARACTERIZATION LABORATORY (LCR).....	<u>13</u>
GEOCHEMISTRY AND PETROPHYSICS LABORATORY (LGP).....	<u>17</u>
ISOTOPES AND GEOCHRONOLOGY LABORATORY (LIG).....	<u>20</u>
ENVIRONMENTAL MONITORING AND BIOTECHNOLOGY LABORATORY (LMA).....	<u>23</u>
LOW CARBON AND HYDROGEN TECHNOLOGIES LABORATORY (LBC).....	<u>27</u>
CERTIFIED REFERENCE MATERIALS.....	<u>31</u>

WHO WE ARE

The Institute of Petroleum and Natural Resources (IPR), established in 2014, aims to foster, promote, and support the sustained growth of the university's initiatives in research, development, and innovation in the fields of petroleum and derivatives, natural resources, energy, and the environment. The IPR represents the consolidation and expansion of the Center of Excellence in Research and Innovation in Petroleum, Mineral Resources, and Carbon Storage (Cepac), inaugurated in 2007.



Director:
Felipe Dalla Vecchia
felipe.vecchia@pucrs.br



VALUE PROPOSAL

Provide multidisciplinary and integrated solutions for businesses and services, based on research, innovation and development in the areas of petroleum and natural resources, in an agile and flexible way with reliable results.

MISSION

The mission of the Institute of Petroleum and Natural Resources (IPR) is to foster and provide sustained growth in research, development, service and innovation in the area of petroleum and natural resources, collaborating with University actions and working together with the market, offering highly qualified service in its actions, services and projects.

VISION

IPR will be one of the most important international reference institutes in research, development and innovation (RD&I), technical quality in laboratory analysis and production of certified reference materials in the area of petroleum and derivatives, natural resources, energy and the environment by 2026, ensuring the sustainability of its activities.



PUCRS

STRATEGIC GOALS

- Pursue financial sustainability;
- Expand and diversify RD&I (with new companies and public calls);
- Diversify the services available by expanding the offer.
- Develop policies, processes and services aligned with QESG and SDGs;
- Qualify the processes and services provided with the implementation of a Quality Management System.
- Implement the culture of data science and information intelligence.

GUIDING PRINCIPLES

- People: ethics, commitment, respect, impartiality, diversity;
- Innovation: creativity, disruptiveness;
- Quality: professionalism, continuous improvement, reference.

QUALITY MANAGEMENT SYSTEM (SGQ)



PUCRS



IPR has a structured quality system accredited according to ISO/IEC 17025 – General requirements for the competence of testing and calibration (AT 3169) and ISO 17034 – General requirements for the competence of reference material producers (AR 3170).

The developed system encompasses a series of standardized procedures and international practices in the technical and management areas for performing tests, sampling, and the production and certification of reference materials.



Quality Manager:
Filipe de Medeiros Albano
filipe.albano@pucrs.br



SGQ QUALITY POLICY

Seek continuous improvement in the quality of laboratories and research facilities, in line with the guidelines of international standards and the University.

Commit to good professional practices and quality in research, testing, sampling, production and certification of reference materials and execution of proficiency tests, offered with a high level of excellence.


Support the fulfillment of the quality management system requirements and continuous improvement of the effectiveness of its processes, guaranteeing the familiarity, confidentiality and impartiality of the personnel involved with the quality documentation and implementation of the management system policies in their work, and complying with the requirements of ISO/IEC 17025, ISO 17034, ISO/IEC 17043 and other IPR and University procedures.



The IPR structure encompasses 5,000 m² of built area within the PUCRS Science and Technology Park (Tecnopuc), distributed across 7 floors of high-complexity laboratories, in addition to administrative infrastructure. The IPR includes the following 6 laboratories:

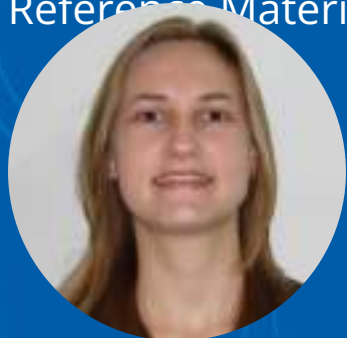
- 1 Chemical Analyses Laboratory (LAQ)
- 2 Rock Characterization Laboratory (LCR)
- 3 Geochemistry and Petrophysics Laboratory (LGP)
- 4 Isotopes and Geochronology Laboratory (LIG)
- 5 Environmental Monitoring and Biotechnology Laboratory (LMA)
- 6 Low Carbon and Hydrogen Technology Laboratory (LBC)





1. CHEMICAL ANALYSIS LABORATORY (LAQ)

The Chemical Analysis Laboratory (LAQ) conducts analyses of stable isotopes; organic elemental composition (CHNSO), including the determination of calorific capacity and CO₂ emission potential; molecular composition of hydrocarbons and light gases; anions; physicochemical parameters; and characterization by FTIR. LAQ supports industries across various sectors, research projects, and plays a key role in the characterization and certification of Certified Reference Materials (CRM) produced by IPR.



Coordinator:
Naira Poerner Rodrigues
naira.rodriques@pucri.br



- EA-IRMS Delta V for $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in solids and liquids;
- EA-IRMS Mat 253 for $\delta^{34}\text{S}$ in solids;
- GB-IRMS Delta V for $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ in carbonates and waters (DIC);
- GC-IRMS for $\delta^{13}\text{C}$ and $\delta^2\text{H}$ in HC, CO_2 , and H_2 in gas;
- Organic elemental analyzer for CHNS/O;
- Gas Chromatograph with FID/TCD/FPD detectors and methanizer;
- Gas Chromatograph with ECD/FID/TCD detectors and methanizer;
- Gas Chromatograph with MS/FID detectors;
- Ion Chromatograph;
- Colorimeter, turbidimeter, pH meter, and conductivity meter for physicochemical analysis;
- Fourier Transform Infrared Spectrophotometer (FTIR).

LAQ is accredited under the ISO/IEC 17025 standard for the determination of the isotopic composition of C, N, S, O, and H; elemental analysis of CHNS/O; anion analysis by Ion Chromatography; determination of hydrocarbons and light gases by Gas Chromatography; physicochemical analyses (pH, conductivity, turbidity, color, and alkalinity); and characterization by FTIR.





2. ROCK CHARACTERIZATION LABORATORY (LCR)

The Rock Characterization Laboratory (LCR) at IPR performs characterization of minerals, sediments, and rocks, as well as other non-geological materials, using various techniques such as X-Ray Diffraction (XRD), X-Ray Fluorescence (XRF), and Microcomputed Tomography (mCT). The laboratory team also conducts qualitative and quantitative petrographic analyses, in addition to supporting education, research, and service provision.



Coordinator:
Rosalia Barili da Cunha
rosalia.cunha@pucrs.br



- X-Ray Diffractometer D8 Advance A25 (Bruker);
- X-Ray Microtomograph Skyscan 1173 (Bruker);
- Stereomicroscope with Discovery V8 digital camera (Zeiss);
- Petrographic microscope with transmitted and reflected light, equipped with AXIOIMAGER A1M digital camera (Zeiss);
- Petrographic microscope with transmitted, reflected light, and fluorescence, equipped with AXIOIMAGER A1M digital camera (Zeiss);
- Stereomicroscope ES2 (Leica);
- Petrographic microscope with transmitted and reflected light, equipped with DMLP digital camera (Leica);
- Rock cutting and grinding machine Discoplan-TS (Struers).



- Polisher and Grinder Labopol-35 (Struers);
- Impregnator CitoVac (Struers);
- Ball Mill 0907 (DeLeo);
- Microscope (Axioscope) with cathodoluminescence (CL) chamber and digital camera;
- Petrographic microscope with transmitted and reflected light (AXIOIMAGER A2M) and TIDAS S 800 UV/NIT 2098 spectrophotometer system for vitrinite reflectance determination (%Ro);
- RockEval 7 for pyrolysis analysis and determination of organic matter type (kerogen), thermal maturity level, and hydrocarbon generation potential.

The LCR is accredited under the ISO/IEC 17025 standard for material analysis using XRD, microCT, and petrographic analyses.





3. GEOCHEMISTRY AND PETROPHYSICS LABORATORY (LGP)

The Geochemistry and Petrophysics Laboratory (LGP) develops experimental and numerical models to study geochemical processes, focusing on the characterization, formation, and alteration of oil and gas reservoirs, as well as potential reservoirs for CO₂ storage. It is equipped with specialized instruments for laboratory experiments, rock-fluid interaction analysis under subsurface conditions, and advanced geochemical modeling tools for flow and reactive transport simulations in porous media. The LGP also has infrastructure for petrophysical characterization of reservoir rocks, measuring porosity, absolute and relative permeability (oil-water or oil-gas), and capillary pressure.



Coordinator:
Rodrigo Sebastian Iglesias
rodrigo.iglesias@pucrs.br



- Pressure vessels for batch experiments, with temperature and pressure control system, sampling, and in situ pH measurement;
- Automated system for continuous flow experiments through core samples (CSES-350);
- Gas porosimeter-permeameter for measuring porosity, effective permeability, and grain volume (AP-608);
- Ultracentrifuge for imbibition, drainage processes, and capillary pressure measurement (URC-628);
- System for measuring relative permeability oil-water-gas (RPS700);
- Saturation and sample cleaning systems;
- Workstations for numerical modeling.

The LGP is accredited under the ISO/IEC 17025 standard for the analysis of rock permeability and porosity.





4. ISOTOPES AND GEOCHRONOLOGY LABORATORY (LIG)

The Isotopes and Geochronology Laboratory (LIG) conducts isotopic analysis across various fields, such as: study of sedimentary basin evolution for the oil and gas industry, environmental and pollution studies, forensic studies, provenance and food adulteration, among others. It is also accredited under ISO 17034 as a producer of Certified Reference Materials.



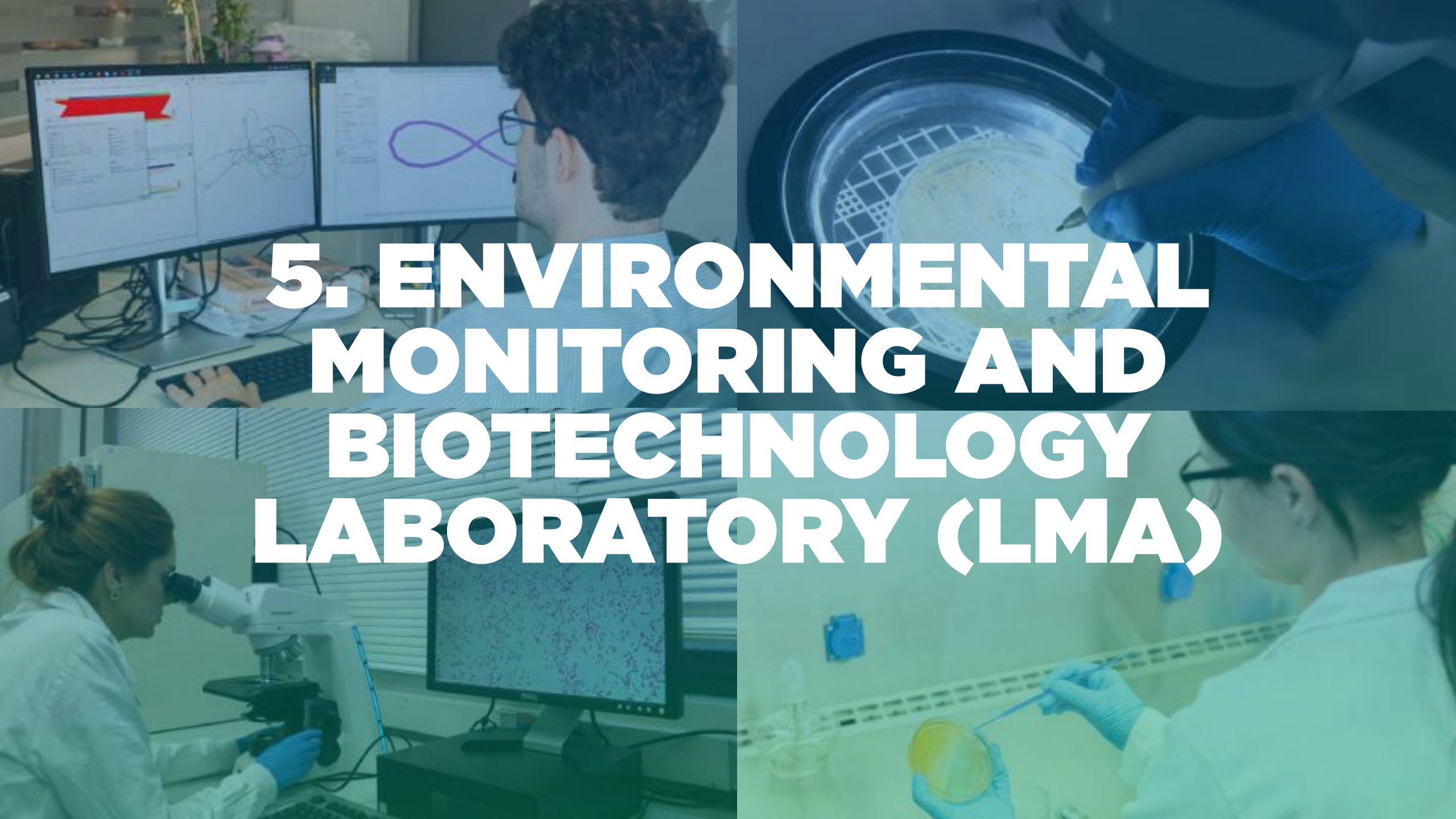
Coordinator:
Anderson Maraschin
anderson.maraschin @pucri.br



- LA-MC-ICP-MS Neptune ThermoFisher with a coupled laser ablation system for geochronological and non-conventional isotope analyses;
- LA-ICP-MS Triple Quadrupole Agilent 8900 with a coupled laser ablation system;
- SubClean acid purifier;
- TraceClean acid steam cleaning system;
- UltraWave Labstation microwave system;
- PrepFast Elemental Scientific dilution system;
- Leica optical petrographic microscope;
- Shimadzu 5-decimal-place analytical balance;
- 360° V-mixer/homogenizer;
- Ultrasonic disruptor/sonicator;
- Class 5 biological safety cabinet;
- Clean boxes with heating plate kit.

The LIG is accredited under the ISO/IEC 17025 standard for the analysis of radiogenic isotopes (strontium) and metals by ICP-MS.





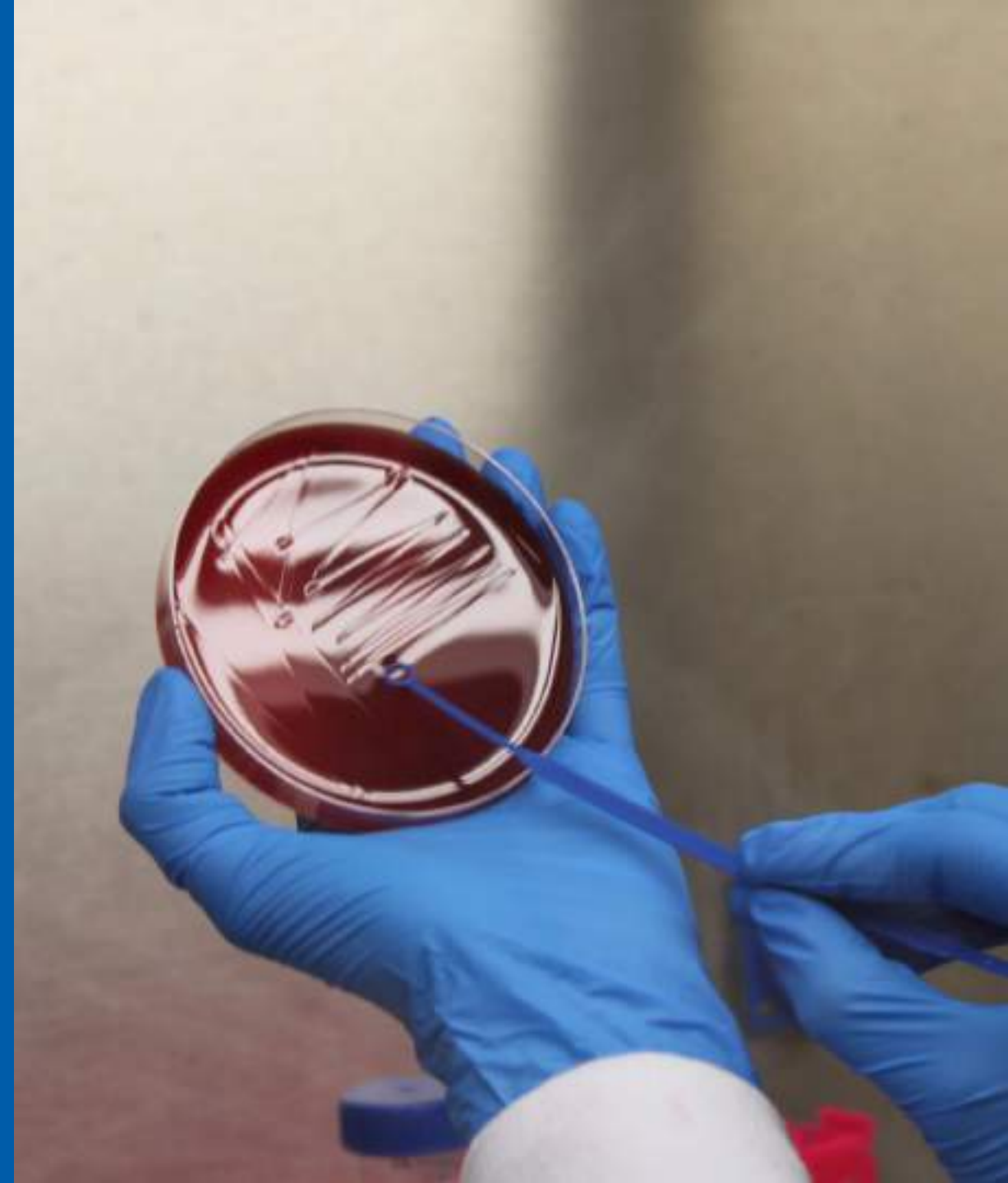
**5. ENVIRONMENTAL
MONITORING AND
BIOTECHNOLOGY
LABORATORY (LMA)**

LMA

The Environmental Monitoring and Biotechnology Laboratory (LMA) conducts environmental monitoring studies through measurements and/or observations of physical and chemical variables in the environment, water and soil sampling, geophysical surveys, as well as microbiological analyses and bioprospecting for new molecules for environmental studies, using its own collection of microorganisms. The LMA also provides services in bacterial genome assembly, RNA-seq data analysis, and water collection for microbiological analyses.



Coordinator:
Francine Melise dos Santos
francine.santos @pucri.br



LMA SERVICES AND EQUIPMENTS

- Pumps for low-flow groundwater sampling;
- MP20 flow cell with multiparameter probe;
- AP 900 multiparameter probe;
- Water/oil interface meter;
- Deep water level meter;
- Leveloggers;
- Automatic Slug/Bail Test kit: hydraulic conductivity tests in wells;
- Guelph permeameter;
- Automatic SuperSting 8-channel electrical resistivity meter and manual Xtal Control X5;
- Differential GPS;
- ADU-07e magnetotelluric system;
- RAS 24 seismograph;
- Dynamic flow chambers: measurement of soil CO₂ flux to the atmosphere, soil moisture and temperature.



- Canisters for sampling and storage of gases, vapor, and atmospheric air;
- Thermocycler;
- Bioruptor (sonicator);
- Qubit – fluorescence quantification of DNA, RNA, and protein;
- Ultrafreezer;
- CO₂ incubator oven;
- High-performance computer; Lyophilizer;
- Sample filtration system;
- Transilluminator – Gel reader;
- Rotary evaporator;
- Bioreactor for microalgae cultivation;
- Visible/UV light spectrophotometer.

The LMA is accredited under the ISO/IEC 17025 standard for sampling (groundwater and surface water), quantitative and qualitative detection of total coliforms and *E. coli*, and quantification of heterotrophic bacteria in water.





6. LOW CARBON AND HYDROGEN TECHNOLOGIES LABORATORY (LBC)

LBC

O Laboratório de Tecnologias de Baixo Carbono e Hidrogênio ampara o desenvolvimento de projetos de PD&I e de serviços de análises para: i) estudo de desempenho e integridade de materiais de poços (cimento e aço), ii) produção e caracterização de hidrogênio, iii) desenvolvimento de compósitos para a indústria de óleo e gás, iv) síntese e teste de inibidores de corrosão, v) caracterização de materiais e testes de desempenho de adsorventes para processos de Captura Direta de CO₂ do Ar (DAC) e vi) estudo de desempenho ambiental de produtos e processos por Avaliação do Ciclo de Vida (ACV).



Coordinator:
Victor Hugo Jacks Mendes dos Santos
victor.santos @puhrs.br



LBC SERVICES AND EQUIPMENTS

- Reactors for short and long-duration CO₂ aging tests;
- Workstations for computational studies: Process simulation, molecular modeling, and fluid dynamics studies;
- Potentiostat/Galvanostat for electrochemical analyses;
- Sample preparation equipment: Ultra-turrax, probe ultrasonicator, and cryogenic mill;
- Gas pycnometer for density testing of solid and semi-solid samples;
- Physisorption and chemisorption analyzer;
- Laser diffraction particle size analyzer;
- Optical tensiometer.



- Electrolyzer for hydrogen production;
- Gas chromatograph coupled with a mass spectrometer (GC-MS);
- Reactors for short and long-duration CO₂ aging tests;
- High-performance liquid chromatograph coupled with a mass spectrometer (HPLC-MS);
- Thermogravimetric analyzer coupled with a mass spectrometer (TGA-MS);
- Differential scanning calorimeter (DSC);
- High-pressure differential scanning calorimeter (PDSC).

The LBC is accredited under the ISO/IEC 17025 standard for particle size analysis (laser granulometry).



CERTIFIED REFERENCE MATERIALS

At IPR, the processes for the production and certification of CRMs are accredited under ISO 17034 "General requirements for the competence of reference material producers" by the American provider ANAB and aligned with ISO GUIDE 35:2017 "Reference materials — Guidance for characterization and assessment of homogeneity and stability."



CRM

At IPR, the processes for the production and certification of Certified Reference Materials are accredited under ISO 17034, "General requirements for the competence of reference material producers," by the American provider ANAB and are aligned with ISO 33405, "Reference materials — Approaches for characterization and assessment of homogeneity and stability."



CRM Coordinator:
Juliana Nichele Kich
juliana.kich@pucri.br





CRM0001

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) in Coconut Sugar

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) CRM

Isotopic Ratio: (-22.65 ‰)

Matrix: coconut sugar

Massa: 1 g

ISOTOPE



CRM0002

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) in Sugarcane Sucrose

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) CRM

Isotopic Ratio: (-12.57 ‰)

Matrix: sugarcane sucrose

Massa: 1 g

ISOTOPE



CRM0003

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) and Elemental Composition of Carbon in Marine Sediment

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) and Elemental Composition of Carbon CRM

Isotopic Ratio: (-18.74 ‰)

Elemental composition of carbon: (2.05%)

Matrix: Marine sediment

Massa: 1 g

ISOTOPE +
ELEMENTAL COMPOSITION OF CARBON



CRM0005

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) in Beet Powder

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) CRM

Isotopic Ratio: (-26.39 ‰)

Matrix: beet powder

Massa: 1 g

ISOTOPE



CRM0006

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) in Fructose

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) CRM

Isotopic Ratio: (-11.41 ‰)

Matrix: fructose

Massa: 1 g

ISOTOPE



CRM0007

Isotopic Carbon Ratio ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) in Milk Powder

Item: Isotopic Carbon and Nitrogen Ratio ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) CRM

Isotope Ratio: (-22.84 ‰ and +5.77 ‰)

Matrix: Milk Powder

Mass: 1g

ISOTOPE



CRM0013

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) in Ethanol

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) CRM

Isotopic Ratio: (-13.36 ‰)

Matrix: Ethanol

Bulk: 2 mL

ISOTOPE



CRM0014

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) in Mineral Oil

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) CRM

Isotopic Ratio: (-28.78 ‰)

Matrix: Mineral oil

Bulk: 2 mL

ISOTOPE



CRM0015

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) and Oxygen ($\delta^{18}\text{O}$) in Calcite

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) and Oxygen Ratio ($\delta^{18}\text{O}$) CRM

Isotopic Ratio: (-4,98 ‰ and -9,77 ‰)

Matrix: Optical calcite

Mass: 1 g

ISOTOPE



PUCRS



CRM0016

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) in Organic Shale

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) CRM

Isotopic Ratio: (-26.76 ‰)

Matrix: Organic shale from a transitional environment

Mass: 1 g



ISOTOPE



CRM0017

Isotopic Carbon Ratio ($\delta^{13}\text{C}$) in Oxidized Organic Shale

Item: Isotopic Carbon Ratio ($\delta^{13}\text{C}$) CRM

Isotopic Ratio: (-24.39 ‰)

Matrix: Oxidized organic shale from a transitional environment

Mass: 1 g

ISÓTOPO



METALS

CRM0008

Multi-element Metal Solution 100 mg/L

Item: CRM of Multi-element Metal Solution

Concentration: 100 mg/L

Elements: Aluminum, Boron, Cadmium, Cobalt, Copper, Iron, Lithium, Magnesium, Manganese, Molybdenum, Nickel, Sodium, Vanadium, Zinc

Matrix: water

Bulk: 250 mL



ANIONS

CRM0004

Multianionic Solution 1000 mg/L

Item: Multianionic solution CRM

Concentration: 1000 mg/L

Elements: Fluoride, Chloride, Bromide, Nitrate, Sulfate and Phosphate

Matrix: water

Bulk: 100 mL



ANIONS

CRM0009

Multianionic Solution 100 mg/L

Item: Multianionic solution CRM

Concentration: 100 mg/L

Elements: Fluoride, Chloride, Bromide, Nitrate, Sulfate and Phosphate

Matrix: water

Bulk: 100 mL



PUCRS



pH

CRM0010

Buffer Solution pH 4.0

Item: CRM Buffer Solution for pH 4.0

Matrix: Water

Bulk: 250 mL



pH

CRM0011

Buffer Solution pH 6.8

Item: CRM Buffer Solution for pH 6.8

Matrix: Water

Bulk: 250 mL



pH

CRM0012

Buffer Solution pH 10.0

Item: CRM Buffer Solution for pH 10.0

Matrix: Water

Bulk: 250 mL



CRM0018

XRF – Major Oxides in Organic Shale

Item: X-Ray Fluorescence CRM

Certified values for major oxides (see CRM certificate)

Elements: SiO_2 , MgO , Al_2O_3 , TiO_2 , MnO_2 , P_2O_5 , K_2O , Fe_2O_3 , Cr_2O_3 , SO_3 , ZnO , SrO

Matrix: Organic Shale

Mass: 10 g



XRF



CRM0019

Solução de Condutividade Eletrolítica 1408,7 $\mu\text{S}/\text{cm}$

Item: CRM Electrolytic Conductivity Solution

Certified value: 1408.7 $\mu\text{S}/\text{cm}$

Matrix: Water

Volume: 250 mL

CONDUCTIVITY



PUCRS

