



CSIR Bioeconomy Enabling Facilities



science, technology
& innovation

Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA



CSIR

Touching lives through innovation

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CSIR capabilities in



BIOMANUFACTURING



PHARMACEUTICALS



AGRICULTURE

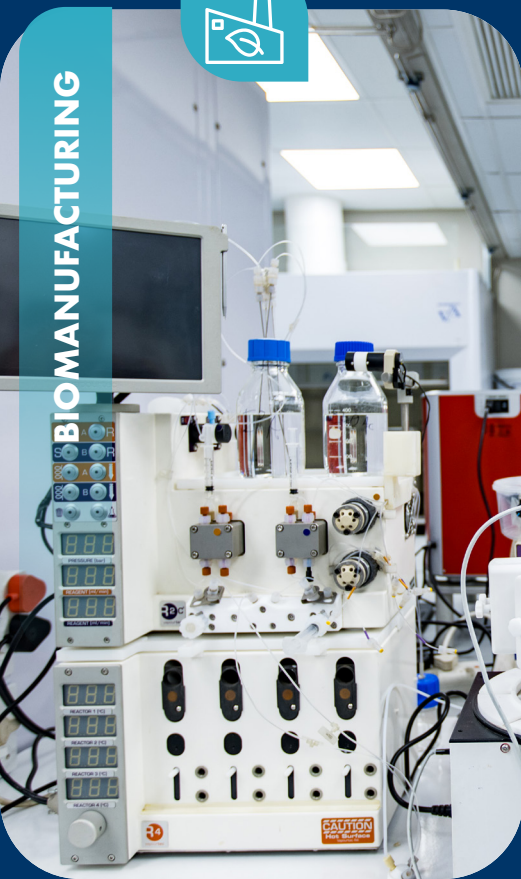
and beyond

The Council for Scientific and Industrial Research (CSIR) is Africa's leading science, engineering and technology organisation, dedicated to turning research into real-world solutions.

In the area of advanced manufacturing, pharmaceuticals, biomanufacturing, agriculture, green chemistry, and food systems, the CSIR boasts world-class facilities and expertise that help drive innovation thus strengthening industries, supporting Small Medium and Micro Enterprises (SMMEs), and shaping sustainable futures.

With these facilities, the CSIR is shaping a resilient, inclusive, and globally competitive bioeconomy for Africa through collaboration and innovation.

BIOMANUFACTURING



PHARMACEUTICALS



AGRICULTURE





Supercritical CO₂ Encapsulation Pilot Plant

This facility enables the development, scale-up and demonstration of uniquely formulated active products using the supercritical carbon dioxide encapsulation process.

This process is especially important for sensitive actives—such as probiotics and plant-based extracts—which often lose activity and shelf-life during conventional processing, making them difficult to develop into viable products.

The plant is the first of its kind in South Africa, established to support the local industry in developing innovative technology-based products for the African market. Support is offered through product development, scale-up, toll manufacturing, and market trials, with applications across nutraceutical, cosmeceutical, personal care and pharmaceutical industries.



Supercritical CO₂ Extraction

Supercritical Fluid Extraction (SFE) is a cutting-edge separation technique that uses carbon dioxide above its critical point (31.1 °C and 73.8 bar) to extract valuable compounds.

At this state, CO₂ exhibits both gaseous and liquid properties, enabling it to penetrate materials while dissolving target substances.

This allows the extraction of bioactive compounds, essential oils, cannabinoids, lipids, and more. The technology supports green chemistry and bio-based innovation and is widely applicable across pharmaceuticals, nutraceuticals, food and beverages, cannabis and hemp, cosmetics, personal care, agriculture, and natural products.





Cosmetic Innovations Lab

Our Cosmeceuticals and Natural Skincare hub is dedicated to supporting small, Medium, and Micro Enterprise (SMMEs) and Agri-businesses with prototype development, proof of concept, product development, testing and analysis.

Inspired by nature, our cosmeceutical formulations delivers botanical actives to nourish, protect and revitalize the skin and hair. The lab provides both quality and regulatory compliant cosmetic products with functional properties such as creams, bath gels, ointments and oils.



Microwave Processing Unit

A patented, FDA-approved aseptic continuous flow microwave food processing technology, adapted from the United States, and installed for the first time in South Africa.

The technology improves shelf-life, nutrition, and food safety standards for fruit, vegetables, and blended food products. Fresh produce can be processed into highly nutritious purees that are sterilised and stored for 12–24 months without refrigeration.

Benefits include:

- Reducing food waste and seasonal supply constraints
- Eliminating the need for preservatives
- Lowering cold storage energy requirements
- Enabling industry use in juices, jams, concentrates, and baked goods





Biomanufacturing Industry Development Centre

The **Biomanufacturing Industry Development Centre (BIDC)** provides technical support to **SMMEs** developing biological products and specialty chemicals. It supports entrepreneurs from concept through to market-ready products and pilot-scale production.

The centre is staffed by experts in biochemistry, biotechnology, process engineering, chemistry, and formulation science, and offers:

- High-end analytical capabilities (mass spectrometry, Nuclear Magnetic Resonance, chromatography)
- Product formulation (tea bagging, sachets, capsules, tablets, extrusion)
- Protein purification (micro to multilitre scale)
- Expertise in downstream processing: centrifugation, filtration, chromatographic purification, solvent extraction, and advanced drying processes
- Lab and pilot-scale bioprocessing facilities, including wild-type and genetically modified microorganisms



Bioprocessing Pilot Plant

The **bioprocess development team** supports the **scale-up of technologies from 10 to 1 000 L** and offers **contract manufacturing of biological materials**.

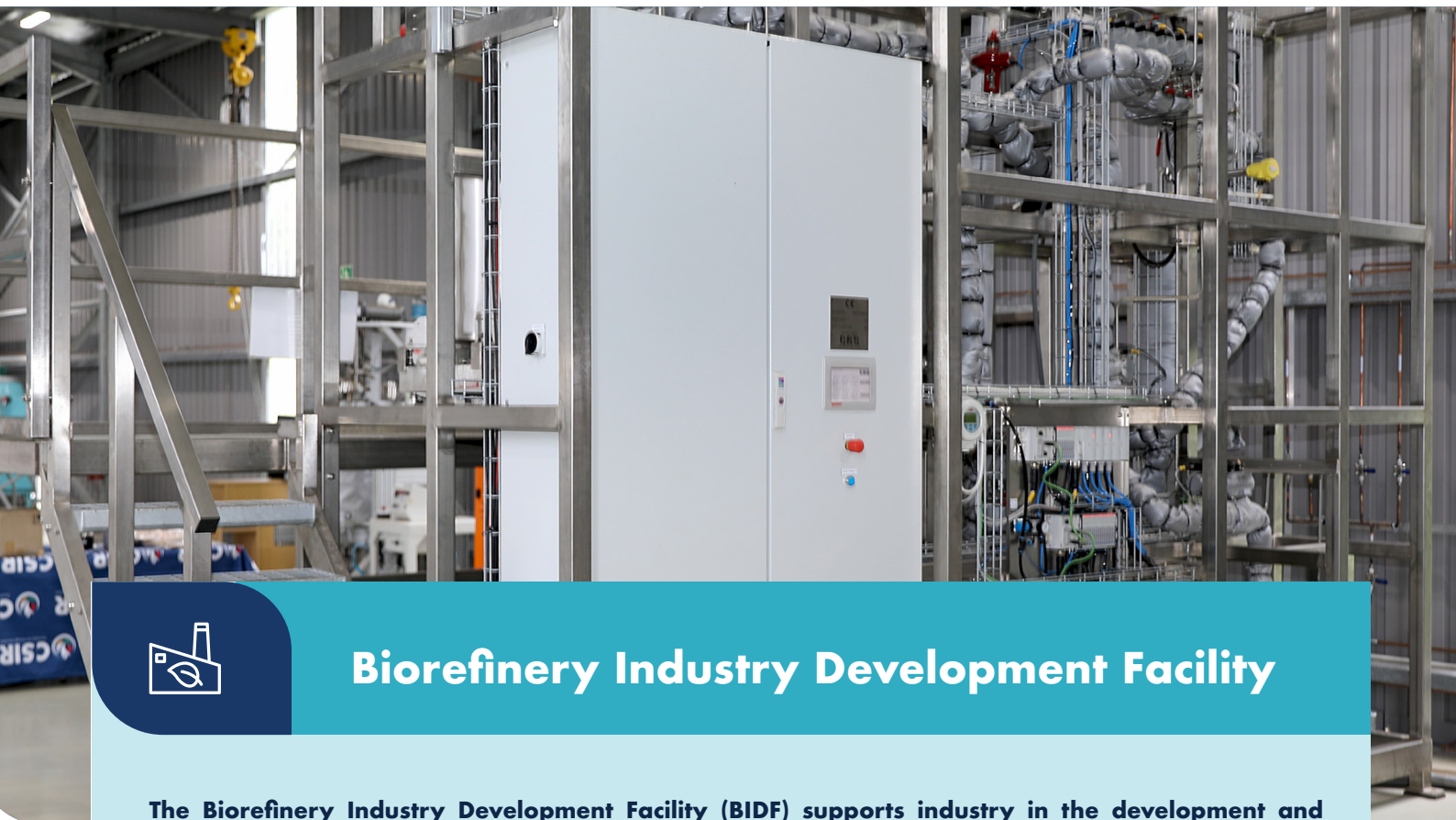
Key competencies include:

- Product and process development
- Product formulation
- Equipment design and commissioning
- Analytical method development
- Fermentation, microbiological synthesis, and protein purification

Facilities include:

Microbiology and fermentation labs, wet and dry processing areas, protein purification laboratories, downstream piloting for distillation, evaporation and extraction, and a full analytical laboratory Gas Chromatography and High-Performance Liquid Chromatography.





Biorefinery Industry Development Facility

The **Biorefinery Industry Development Facility (BIDF)** supports industry in the development and scale-up of biorefinery products and processes, bridging the gap between research and commercial implementation. Our focus is on advancing integrated biological and chemical conversion technologies that transform waste biomass feedstocks into high-value chemicals and materials, contributing to the replacement of fossil-based feedstocks and promoting a circular bioeconomy.

- **Analytical characterisation laboratory** – encompasses a range of analytical instruments, including the pyrolysis gas chromatograph mass spectrometer, along with other analytical tools which enable characterization of biomass feedstock and evaluate newly developed products.
- **Bench/pilot-scale laboratory** – hosts a range of bench-scale and pilot-scale digesters required for the fractionation of biomass into its chemical constituents. It also houses bench-scale a biogas reactor that enables the evaluation of biogas production over a 25-day period. This facility supports external ad hoc pulping research and development experiments for large pulp and paper companies.
- **Scale-up facility** – enables scale up from bench-scale trials to pilot-scale level, using bench and pilot-scale biochar reactors and a rapid displacement heater digester. It also houses a wastepaper recycling plant that enables the team to evaluate different paper waste streams that enable fibre recovery for reuse applications.



FuturePHARMA (BioPharma)

This multipurpose biopharmaceutical infrastructure provides facilities for producing investigational biologics—including vaccines—for pre-clinical and early clinical development.

It includes ISO 7 cleanrooms for processing, ISO 5 fill/finish, and all unit operations for biopharmaceutical production.

The facility operates on an open-access basis, available to universities, SMMEs, and industry to mature vaccine and biopharmaceutical technologies towards clinical application. It also supports training of a skilled local workforce, strengthening Africa's self-sufficiency in vaccine and biopharmaceutical production.



FuturePHARMA (Flow Chemistry)

A specialised facility enabling the local production of critical modern drugs through continuous flow chemistry and hybrid processing technologies.

It provides expertise in Active Pharmaceutical Ingredient process development and scale-up, bridging the gap between research and development and industrial implementation.

By integrating advanced chemical processing methods, the facility enhances efficiency, improves safety, and supports the localisation of pharmaceutical manufacturing—providing a key stimulus for re-industrialisation in South Africa.



Biodegradability Testing Facility

The CSIR hosts Africa’s only facility for measuring biodegradation and compostability of materials.

Testing follows international standards (OECD, ASTM, EN, ISO) and uses an automated respirometer with 24 channels, CHNS elemental analysis, bioreactor systems, and automated titration.

Established with support from the Government of Japan through UNIDO, the facility enables verification of biodegradability claims and supports South Africa’s transition towards a circular economy.



Food Analytical Laboratory

This advanced food safety laboratory houses a two-dimensional chromatography system capable of high-accuracy analysis with fast turnaround.

It identifies complex volatile compounds in contaminated foods, detects emerging contaminants (e.g. Polycyclic Aromatic Hydrocarbons, Mineral Oil Saturated Hydrocarbons or Mineral Oil Aromatic Hydrocarbons), and performs fragrance and flavour profiling—helping to combat the growing challenge of food adulteration.



Food Innovations Lab

A hub supporting SMMEs in the agri-food sector by providing access to advanced product development and prototyping tools.

Facilities include:

- Freeze drying technology for shelf-stable, high-value products (fruit snacks, soups, herbal teas, powders)
- 3D food printing for functional foods, health-conscious snacks, and gourmet innovation

The lab enables entrepreneurs to refine products, improve quality, and meet market and regulatory requirements while reducing risk and cost.





Capsule Laboratory

A specialised facility for the development and production of capsules.

It is equipped with machines for:

- Capsule filling and sealing
- Polishing and quality assurance
- Counting and packaging
- Particle size reduction and separation

The lab enables efficient, small-scale production of high-quality capsule products for research and development.



Botanical Supply Unit

A versatile facility for processing plant-based materials, equipped with:

- Spray dryers
- Hydraulic press
- Cold storage
- Heating/melting tanks
- Washing and weighing rooms
- Tea-bagging and blending equipment

This unit supports the development of herbal products, nutraceuticals, and functional foods, helping small producers access advanced technologies for pilot-scale manufacturing.



About the CSIR

Founded in 1945, the Council for Scientific and Industrial Research (CSIR) is Africa's leading multidisciplinary research and development organisation. We use science, engineering and technology to foster industrial growth, improve quality of life, and shape a globally competitive Africa.



Impact and Global Relevance

The facilities highlighted during the G20 visit demonstrate Africa's growing capacity to:

- Advance sustainable and circular industries
- Strengthen food and nutrition security
- Enable local pharmaceutical production
- Support SMMEs and inclusive innovation
- Position Africa in global biotechnology value chains



Work with us

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