

#02

VITRINA DE

INVESTIGACIÓN

► DISEÑO UDD

DIC. 2025

**CENTER FOR
RESEARCH IN
SUSTAINABLE
MATERIALS.**



Universidad del Desarrollo
Facultad de Diseño

VITRINA #2

Center for Research in
Sustainable Materials

Design and science for sustainability.

Interdisciplinary development
towards a materials research
center.

The Design School of Universidad del Desarrollo presents the second edition of the **Vitrina de Investigación en Diseño UDD** (UDD Design Research Showcase). This initiative seeks to showcase our school's most significant challenges, projects, and achievements in the field of design research, with the aim of contributing to the development of the discipline and opening up new opportunities for collaborations at a global level.

In this edition, we will explore the path that has led the UDD School of Design to establish the **Center for Research in Sustainable Materials**, the culmination of more than a decade of work focused on integrating design, science, and innovation to address the environmental and productive challenges of the 21st century. The complexity of global problems, such as pollution, the water crisis, and waste accumulation, requires new forms of collaboration that bring together design, biotechnology, engineering, and basic sciences. Since 2012, the School has promoted experimental projects, interdisciplinary research, international partnerships, and pioneering training programs that have shaped a solid line of development in sustainable materials.

The UDD Sustainable Materials Center is built on this premise: interdisciplinarity as a driver of innovation. By integrating the experimental logic of the laboratory with the project-based vision of design, the Center promotes new ways of understanding, developing, and designing materials. Its contribution is further strengthened through active collaboration with the national and international innovation ecosystem, promoting applied research, interdisciplinary training, and technology transfer so that patents, prototypes, and processes advance toward implementable solutions with real impact. The incorporation of UDD into the **Ibero-American BIO-RED CYTED Network**, along with the participation in the **Biodesign Challenge** and collaboration with institutions such as **UC Davis** (United States), expands our networks and allows us to situate our work in a global ecosystem committed to the development of sustainable materials from the convergence of art, science, and technology.

Looking ahead, our goal is clear: **to build a bridge between knowledge generation and sustainable production**, positioning design as a strategic discipline for creating solutions with social, environmental, and economic impact. A future in which every material developed is also a proposal for change and an invitation to rethink how we live and produce in our environment. We are deeply grateful to those who have been a part of this journey and invite you to explore this new edition of the Showcase, which reflects the spirit, capabilities, and vision of our School of Design.



Alejandra Amenábar Figueroa
Dean
School of Design
Universidad del Desarrollo



Paulina Contreras Correa
Research Director
School of Design
Universidad del Desarrollo

This center is nourished by a dynamic structure composed of four strategic areas (see fig 01) that connect scientific research with training, innovation, and education.

Each one of these axes provides spaces for experimentation where **creativity, critical thinking, and technical rigor converge**, strengthening the link between design and science to give rise to new sustainable materials, processes, and applications.

More than independent entities, these axes function as a complementary ecosystem: undergraduate and graduate projects fuel applied research; the Integrated Biodesign Workshop translates science into educational experiences; research projects expand the scope of the technology transfer, and school partnerships extend this knowledge to future generations.

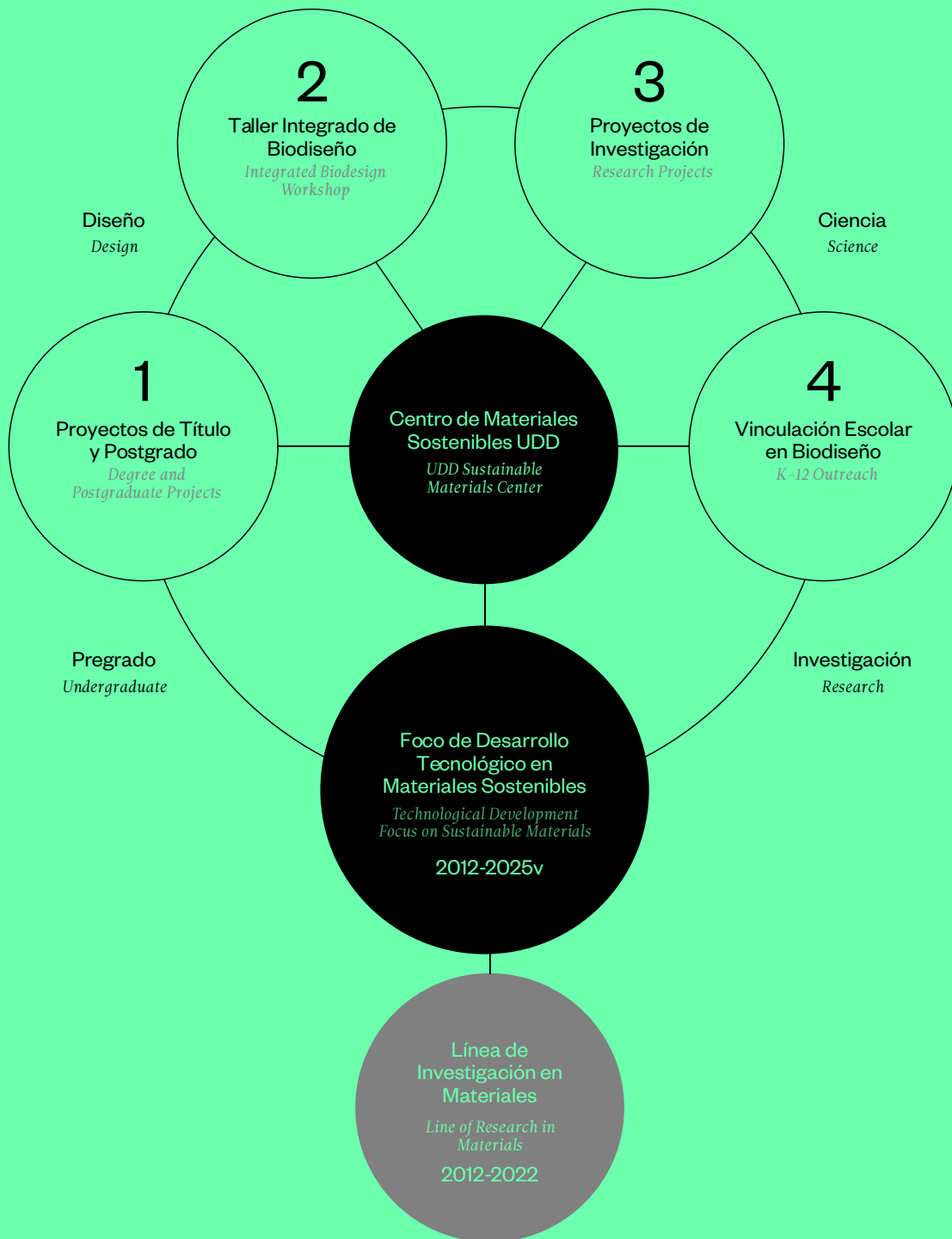
Together, they form the engine that drives the School of Design's research into sustainable materials, integrating knowledge, actors, and scales of action around a common purpose: to imagine and build materials for a sustainable future.



01. Interdisciplinary Research and Development in Sustainable Materials Center.

Fig 01:

Axes that nourish the line of research in Sustainable Materials.





1 Degree and Postgraduate Projects



2 Integrated Biodesign Workshop



3 Research Projects



4 School Linkage in Biodesign

1.

Undergraduate and Postgraduate Projects

Since 2012, UDD Design degree projects have evolved toward the exploration of biomaterials obtained from the revaluation of organic waste and bio-manufacturing processes, becoming the starting point for a new way of researching from design. This milestone represents the culmination of the students' educational process, where material experimentation, project management, and applied research converge.

Over the years, multiple bio-based materials have been developed using waste such as fruit peels, seashells, plant debris, or fishing by-products, along with processes involving living organisms such as mycelium, kombucha, and cellulose-producing bacteria. On average, seven projects per year address biomaterial issues, consolidating an academic community focused on innovation and sustainability.



02. Biomaterial made from grass clippings. Degree project by Francisca Pinto. Winner of Diseño Responde The Index Project (c) (2021).

The Center promotes the continuity of the most promising projects through the UDD Alumni Technological Development Support Program (PADT) Alumni UDD, funding and training program which allows proposals to be scaled up to technical and industrial validation stages. A notable example is the work of Trinidad Lazcano, who developed the project Revalorizando especies invasoras a través del diseño de un bioaglomerado (Revaluing invasive species through the design of an agglomerate), which transforms eucalyptus waste into boards for construction, incorporating antimicrobial properties and high durability. This project has completed its Physicochemical validation phase and is currently undergoing legal evaluation for patenting.



03. Biomaterial based on eucalyptus waste. PADT Alumni Project by Trinidad Lazcano (2023)

Fig 02:

Table of degree projects based on materials, students, and supervising teachers, between 2020 and 2024.

1. Proyectos de Título en nuevos materiales | Bachelor's projects in new materials

2020	2021	2022	2023	2024
1 proyecto 1 project	6 proyectos 6 projects	9 proyectos 9 projects	7 proyectos 7 projects	12 proyectos 12 projects
<ul style="list-style-type: none"> ● CitriCo¹ Cáscaras de cítricos <i>Citrus peels</i> María Amalia Muñoz 	<ul style="list-style-type: none"> ● Namun² Salmón <i>Salmon</i> Francisca Campos ● Cespress³ Césped <i>Grass</i> Francisca Pinto ● Quince³ Residuos orgánicos industriales <i>Industrial organic waste</i> Josefina Basoalto ● Caras.Co² Paltas <i>Avocados</i> Martina Herrera ● Sal Dental⁴ Sal de mar <i>Sea salt</i> Paula Hürth ● Reintegra⁵ Uvas <i>Grapes</i> Paula Numair 	<ul style="list-style-type: none"> ● Biomateriales que Hablan⁶ Conchas <i>Shells</i> Fernanda Saval ● Flora⁷ Flores <i>Flowers</i> Valentina Fuentes ● Algum⁵ Alga <i>Algae</i> Claudia Novoa ● Purescale⁵ Pescado <i>Fish</i> Isabel Baraona ● De Viruta⁵ Hongo; mimbre <i>Fungus; wicker</i> Isidora Lineros ● Saba⁵ Aserrín <i>Sawdust</i> Jacinta Laso ● Efmiera⁵ Huevo <i>Eggs</i> Valentina Díaz Goje ● Spiro⁴ Algas <i>Algae</i> Agatha Gildemeister ● Biotextiles como alternativa a la industria textil⁸ Algas <i>Algae</i> Camila Montero 	<ul style="list-style-type: none"> ● Bentos² Conchas de erizo <i>Sea urchin shells</i> José Pablo Castillo ● Biolentejuelas² Escamas de pescado <i>Fish scales</i> Valentina Clavel ● Revalorizando especies (...) diseño de un bioaglomerado⁶ Eucalyptus <i>Eucalyptus</i> Trinidad Lazcano ● AquaPorex⁴ Picón y cemento <i>Picón (volcanic rock) and cement</i> Sofía Kusanovich ● Cellea⁷ Papaya <i>Papaya</i> Amanda González ● Revitalización costera (...) Quintero⁴ Biorremediación <i>Bioremediation</i> María Barbagelata ● Dampes⁴ Biofiltración <i>Biofiltration</i> Francisca Ortiz 	<ul style="list-style-type: none"> ● Cordextil¹⁰ Raquetas de tenis <i>tennis rackets</i> Antonia Cousiño ● Bioflora y Diseño² Flora chilena <i>Chilean flora</i> Bernardita Barayon ● BoB ¿Basura o biomaterial?⁹ Residuos orgánicos <i>Organic waste</i> Carolina Rivadeneira ● Vestir el residuo¹⁵ Bagazo de malta <i>Malt bagasse</i> Emilia Conchaossa ● Bivell¹⁶ Conchas <i>Shells</i> Francisca Gárate ● Cu0⁵ Cobre <i>Copper</i> Isidora Richard ● Ecoiris⁹ Residuos orgánicos <i>Organic waste</i> Magdalena Escudero ● Bioficus⁴ Opuntia ficus-indica <i>Opuntia ficus-indica</i> María Alejandra Silva ● Hojas de Otoño¹¹ Hojas secas <i>Dry leaves</i> María Luisa Cruz ● Desde mi raíz¹² Araucaria <i>Araucaria</i> Maureen Matthei ● Molive¹³ Olivo <i>Olive tree</i> Pascale Parada ● Ecophycea¹⁴ Algas pardas <i>Brown algae</i> Sofía Urzúa

Duplas Docentes

1 Clarisa Menteguiaga - Ximena Ulibarri	7 Daniela Reyes - María José Williamson	13 Alejandra Ruiz - Jaime Ramírez
2 Alejandra Amenábar - Paulina Contreras	8 Lorena Sanhueza - Ricardo Uribe	14 María Paz Cuadra - María Gálmez
3 Francisco Fuentes - Francisco Zamorano	9 Mariluz Soto - Ximena Ulibarri	15 Úrsula Bravo - Mariluz Soto
4 Denisse Lizama - Ian Tidy	10 Andrea Martínez - Gabriela Olivares	16 Hernán Díaz - Daniela Cartes
5 Alejandra Ruiz - Trinidad Justiniano	11 Osvaldo Zorzano - Teresita Silva	17 Enzo Anziani - Beltrán Díaz
6 Catalina Cortés - Úrsula Bravo	12 Gabriela Fariás - Mary Buenaventura	



1
Degree and
Postgraduate
Projects



2
Integrated
Biodesign
Workshop



3
Research
Projects



4
School Linkage in
Biodesign

2.

Integrated Biodesign Workshop

The Integrated Biodesign Workshop is an educational experience that allows students from different disciplines - from Space and Object Design to Digital Interaction Design - to work in an interdisciplinary manner on real environmental challenges.

Its methodology encourages the exploration of biology as a source of inspiration and as a productive system, promoting bio-design with environmental and social impact. Since its implementation in 2021, the workshop has generated projects ranging from water remediation to textile waste reduction, applying bio-manufacturing processes, natural simulations, and circular economy strategies.

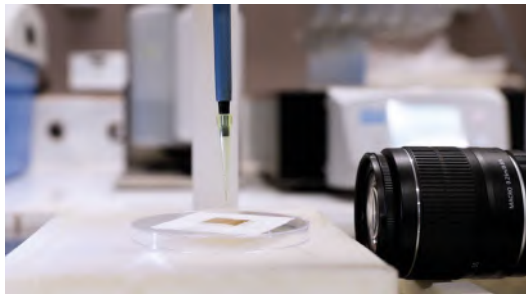
Among the most notable projects: CaCo, a water purification system using calcium carbonate from marine waste; StronGum, a protein-enriched bio-gum for athletes; **ZOOA**, an adhesive filter that captures microplastics in domestic sewage; and Kelpure, a water purification proposal based on local algae.

These initiatives,
recognized
internationally in the
Biodesign Challenge,
reflect the potential
of Chilean design to
promote innovation
through sustainability.

Fig 03:

Table of integrated biodesign workshop projects and details of the projects' participation in the Biodesign Challenge between 2021 and 2024.

2. Taller Integrado de Biodiseño <i>Integrated Biodesign Workshop</i>			
2021	2022	2023	2024
8 proyectos 8 projects	5 proyectos 5 projects	7 proyectos 7 projects	3 proyectos 3 projects
<ul style="list-style-type: none"> ● CaCO Purificador de agua CaCO₃ A CaCO₃ -based water purifier Migdlena Cordero, Isabel Barona y Erika Hauke Finalistas Biodesign Challenge 2022 ● Beed Nido para abejas basado en antocianinas Anthocyanin-based bee nest ● Betterwalk Plantilla antimicrobiana para pie diabético Antimicrobial insole for diabetic foot ● Lium Packaging de micelio Mycelium packaging ● Mowa Captador de agua de neblina Mist water collector ● Bioproof Revestimiento retardante de fuego Fire retardant coating ● Peels Aglomerado de cáscara de plátano Banana peel agglomerate ● Purilab Biofiltro de agua Water biofilter 	<ul style="list-style-type: none"> ● StrongGum Chicle biodegradable Biodegradable gum Bernadita Jiménez, María José Mendez, Fabila Mosquera Enviado a Biodesign Challenge 2023 ● Kifeet Zapato/plantilla biopolimérica para niños Biopolymer shoe/insole for children ● Pureskin Protector solar facial UV UV facial sunscreen ● Scolastic Polímero laminado para Ensilado Laminated Polymer for Silage ● Nonsoun Aislante acústico Acoustic insulation 	<ul style="list-style-type: none"> ● Zooa Filtro de lavadora para microplásticos Washing machine filter for microplastics Valentín Vera y Pía Manzano Enviado a Biodesign Challenge 2024 ● Bio-Leva Biorremediación de metales pesados en aguas lluvias Bioremediation of heavy metals in rainwater ● Cápsulas para cultivo Sistema de recuperación de suelos degradados System for the recovery of degraded soils ● Detect-Ma Detección de incendios con Melanophila Acuminata Fire detection with Melanophila Acuminata ● Alsol Catalizador químico cutáneo para el suplemento de Vit D Cutaneous chemical catalyst for Vit D supplementation ● MyCo Piezas modulares basados en micelio y hormigón Modular pieces based on mycelium and concrete ● Nano Filtro antimicrobiano basado en telas de araña, cobre y carbón Antimicrobial filter based on spider webs, copper and carbon 	<ul style="list-style-type: none"> ● Kelpure Filtro de agua Water filter Natalia Reyes, Luz María Díaz y Macarena Villanueva Enviado a Biodesign Challenge 2025 ● Agromorph Material flexible disipador de calor Flexible heat dissipating material ● Freskia Packaging inteligente de frutillas Smart packaging for strawberries



●
04. Zoa.Microplastic filter.
Integrated Biodesign Workshop
Project. Valentina Vera and
Pía Manzano (Año)



1
Degree and
Postgraduate
Projects



2
Integrated
Biodesign
Workshop



3
Research
Projects



4
School Linkage in
Biodesign

3.

Research Projects

The UDD School of Design has developed more than 20 research projects in **biomaterials, sensors, bioenergy, and remediation**, funded by ANID and institutional funds.

The UDD School of Design has developed more than 20 research projects in biomaterials, sensors, bioenergy, and remediation, funded by ANID and institutional funds.

These projects have allowed for the consolidation of a robust line of research, with 19 scientific publications in indexed journals (Q1–Q2), multiple inter-faculty collaborations, and current applications for national and international funding.

The work has focused on the development of bio-based functional materials, such as papers modified with metal nanoparticles, biopolymers, and active compounds capable of detecting or eliminating contaminants. One of the milestones in this line of research is the patent for antimicrobial cellulose and copper paper, registered in Chile and Brazil, Cu-Paper, a technology that marked the formal beginning of interdisciplinary research into materials within the Faculty.

In collaboration with the University of California, Davis (UC Davis), we implemented the Growing Biodesign Collaborations for Increased Circularity project. This initiative strengthened the link between both institutions and led to the creation of the Biodesign and Industry event, which brought together academics and international experts to manufacture and analyze biomaterials with antimicrobial properties using electrolysis, sonication, and chemical reduction processes. This meeting highlighted the importance of interdisciplinary research as a driver for sustainable research and innovation.



05. Diego Martínez Fernández del Castillo, MFA student, UC Davis; Yuanshuo Mai, Synthetic Biology and Design student UC Davis; Ricardo Lynch, Diseño UDD; Valeria La Saponara, Professor, UC Davis Department of Mechanical and Aerospace Engineering; Nataly Silva, Diseño UDD; Sloka Suresh, alumna, Global Disease Biology UC Davis; Laura Daily, Biomedical Engineering student; Alejandra Ruiz, Design Lecturer, UC Davis Department of Design; Christina Cogdell, Professor, UC Davis Department of Design and Paulina Contreras, Research Director UDD Design



06. Integrated Workshop students' participation in Biodesign and Industry Week.



1
Degree and
Postgraduate
Projects



2
Integrated
Biodesign
Workshop



3
Research
Projects



4
School Linkage in
Biodesign

4.

Biodesign School Outreach

The fourth axis expands the laboratory's scope into school education, to foster an interest in science and sustainability through design from an early age. In partnership with Dra. Giovanna Danies from the Universidad de los Andes (Colombia), a school outreach program in biodesign is being developed that adapts the principles of the university laboratory to educational experiences for children and youth.

This axis integrates biology, art, and design content so that elementary and middle school students can experiment with the manufacture of bioplastics and biomaterials, gaining a tangible understanding of concepts such as the circular economy and biomimicry. The project seeks to transform the classroom into a space for scientific and creative exploration, where future citizens can understand the value of sustainable materials and their impact on the environment.

In 2025, this initiative supports the Fondart project application: Biodiseño en el aula: exploraciones vivas para la educación sostenible (Biodesign in the classroom: living explorations for sustainable education), which aims to expand the model to schools in different regions of Chile, strengthening STEAM education through design and promoting a more conscious and regenerative material culture.

The fourth axis expands the laboratory's scope into **school education**, to foster an interest in science and sustainability through design from an early age



08. Biodesign activities.

MILESTONES IN SUSTAINABLE MATERIALS RESEARCH.

The Sustainable Materials Research line at the UDD School of Design gathers more than a decade of interdisciplinary work between design, science, and technology. Its evolution has allowed us to transform local resources into advanced materials, consolidating us as a national benchmark in applied and sustainable innovation.

Milestone 1

The origin: Cu-Paper and the first institutional patent

The starting point was Cu-Paper (2013), led by **UDD Design Dean Alejandra Amenábar** and her **Research Director, Paulina Contreras**, with the scientific collaboration of Víctor Apablaza and Nataly Silva. The project combined two key raw materials from Chile, copper and cellulose, to create antimicrobial paper with bactericidal, fungicidal, and antiviral properties.

Throughout the process, the team optimized the generation of copper microparticles (MPCu) and validated their effectiveness against bacteria, fungi, and viruses, including SARS-CoV-2. The technology progressed from laboratory tests to industrial trials in collaboration with CMPC and Forestal y Papeles Concepción (FPC).

This development prompted the first national and international patent for UDD ("Cellulose-based materials incorporating a copper-based biocide agent", INAPI 2020; INPI Brasil 2022), marking a turning point for design research.

In addition, **Cu-Paper** integrated research into undergraduate studies early on and inspired projects exhibited at the **SaloneSatellite in Milan in 2023**, laying the foundations for the **Center for Research in Sustainable Materials**.



08. Revista Base N°1, **Leer Aquí**



09. Proceso y resultados de Cu-paper

Milestone 2

Strengthening the research team: welcoming Dr. Nataly Silva (2019)

The addition of Dr. Nataly Silva, chemist and PhD in Chemistry from the University of Chile, in 2019, drove a qualitative leap forward in the line. Her expertise in nanotechnology, materials chemistry, and electrocatalysis strengthened the experimental components, enabling progress toward functional materials, sensors, environmental remediation systems, bioenergy, and smart materials.

“Cu-Paper allowed us to demonstrate that when design is linked to science, real solutions emerge, can scale up and answer to global challenges from the Chilean territory”,
Nataly Silva.

During this period, the line of research was recognized as a **Priority Technological Development Focus by the UDD Vice-Rector's Office for Research**, facilitating advanced infrastructure, new funding, and international partnerships.



10. Nataly Silva.

Milestone 3 **Creation of the Sustainable Materials Laboratory (2025)**

In 2025, the Sustainable Materials Laboratory was inaugurated, a 90 m² space equipped to address the synthesis, processing, and characterization of bio-based, bio-manufactured, and nanotechnological materials.

Its model connects early-stage research (TRL 2–3) with pre-industrial validation (TRL 6), integrating academic projects, applied research, and technology transfer. Today, the laboratory is a collaborative hub for designers, chemists, engineers, and biologists focused on transforming creativity into sustainable solutions.



11. Sustainable Materials Laboratory.

Hito 4

Incorporation of Dr. Andrea Wechsler (2025)

The addition of Dr. Andrea Wechsler, designer and PhD in Built Environments, broadened the focus to architecture, habitat, and the built environment. Her leadership enabled the **UDD School of Design to join the Ibero-American Network BIO-RED CYTED**, dedicated to biomanufacturing and sustainable materials, enhancing the Center's international profile.

This opened up new lines of work in thermal, acoustic, and structural properties, strengthening the relationship between design, science, and sustainable construction.

“Currently, our mission is to connect the development of new materials with the challenges of contemporary living, integrating efficiency, sustainability, and well-being into the spaces we inhabit”,
Andrea Wechsler.



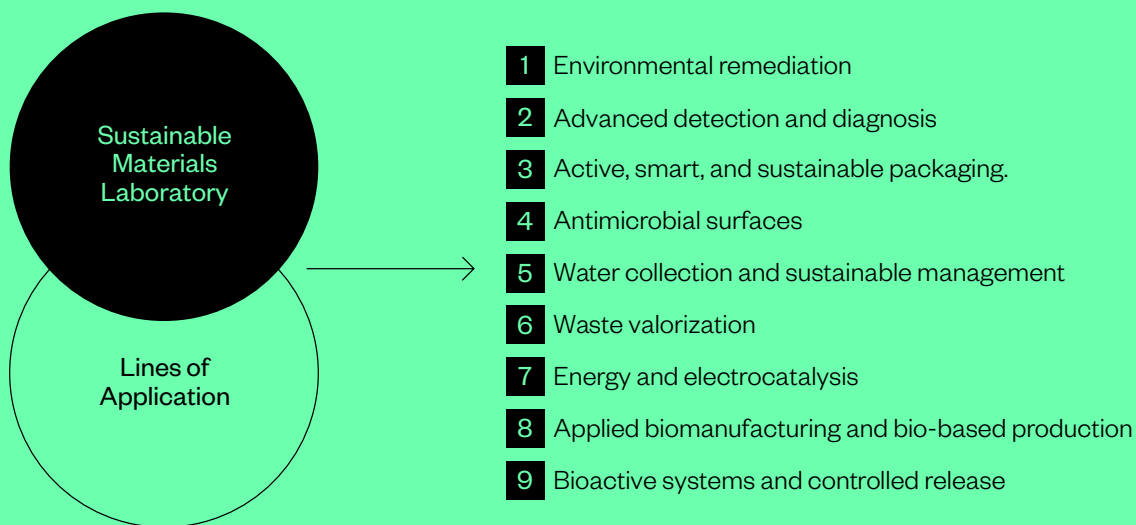
12. Dr. Wechsler with students

Fields of Application: UDD Sustainable Materials Laboratory

The Center promotes nine lines that integrate science, design, and sustainability. These nine lines articulate a framework for action that connects research with industry, education, and everyday life, exploring new material formats that combine functionality, efficiency, and respect for the environment.



13. Students at Sustainable Materials Laboratory.



1. Environmental remediation

Developing materials and systems capable of capturing, transforming, or neutralizing pollutants in water, air, and soil. Through biopolymers, nanoparticles, and porous materials, this line creates filters and reactive surfaces aimed at ecosystem regeneration and sustainable decontamination processes, accessible to industries and communities.

2. Advanced detection and diagnosis

Designing smart sensors and electrochemical or optical devices that enable rapid and accurate identification of chemical, biological, or environmental changes. Integrated into paper, textiles, or flexible films, these systems facilitate health, water, and air quality monitoring, combining science and design to improve decision-making processes.

3. Active, smart, and sustainable packaging.

Researching packaging that not only protects, but also interacts with its contents or environment through controlled release, molecule capture, or visual indicators. Its goal is to extend the shelf life of food, reduce waste, and communicate its condition, integrating design, chemistry, and biotechnology into responsible and innovative solutions.

4. Antimicrobial surfaces

Developing coatings and materials with antimicrobial, antifungal, and antiviral properties for paper, textiles, polymers, and building surfaces. Through techniques such as spray coating or layer deposition, this line seeks to improve safety in clinical, domestic, and industrial spaces, continuing the legacy of the Cu-Paper project.

5. Water collection and sustainable management

Exploring devices and materials that capture, filter, and reuse water through natural processes and bio-inspired geometries. Its developments focus on modular and decentralized solutions that promote climate adaptation and water self-sufficiency, especially in vulnerable areas.

6. Waste valorization

Converting industrial, forestry, and agri-food waste into new materials or energy resources through pyrolysis, co-pyrolysis, and other transformation routes. This line produces biochar, pyrolytic oils, and functional compounds, promoting a circular economy where design redefines waste as raw material.

7. Energy and electrocatalysis

Developing materials and technologies for the generation, conversion, and storage of clean energy, such as non-precious electrocatalysts, hybrid membranes, and separation systems for green hydrogen. This line combines fundamental research and emerging applications in mobility, domestic energy, and industrial efficiency.

8. Applied biomanufacturing and bio-based production

Integrating biological processes into the creation of materials, using organisms such as fungi, bacteria, or algae that generate or transform matter during their growth. It includes the development of bioplastics, textiles, and structural components, opening up new aesthetics and production systems where the material is grown rather than manufactured.

9. Bioactive systems and controlled release

Designing materials capable of releasing or retaining molecules in a controlled manner for applications in health, agriculture, and environmental well-being. This line focuses on their stability, biocompatibility, and behaviour over time, targeting smart materials that actively interact with their environment.

Research and Application products

The work of the UDD Center for Research in Sustainable Materials is reflected in concrete results that integrate creation, knowledge generation, and technology transfer. Each project, publication, or patent is an example of applied research arising from the dialogue between design, science, and technology, and reflects the Center's commitment to sustainability and interdisciplinary innovation.

For more than a decade, this line has produced functional prototypes, experimental materials, scientific articles, patents, and international partnerships, all linked to the nine lines of application that guide the work of the Sustainable Material Laboratory.

The following table brings together these research products, organizing them according to their line of application, year of development, type of result (paper, patent, or project), and their contribution to knowledge or industry. Together, they offer a comprehensive view of the impact and level of technological maturity achieved by the Center.

Challenges and future directions

The Center is projected as a strategic player in the national innovation ecosystem, with challenges that include: strengthening technology transfer and scaling solutions for industry; consolidating national and international partnerships; expanding research in biomanufacturing, sustainable architecture, and bio-based materials; deepening interdisciplinary training for students and professionals; positioning design as a bridge between scientific knowledge, industry, and society.

From its lab, **UDD moves towards a future where every material developed is a concrete proposal for sustainability and innovation.**



14. Sustainable Materials Laboratory.

Research products

Sustainable paper-based composite with beta-cyclodextrin and metallic nanoparticles for efficient nitroaromatic compound removal from water.

Carbohydrate Polymers (2025).

Ver

Cellulose paper as a sustainable substrate for the bacterial biosynthesis of metal nanoparticles.

International Journal of Biological Macromolecules (2025).

Ver

Enhanced hydrogen generation through electrodeposited non-precious metal Zn/Cu-BTC metal-organic frameworks on indium tin oxide.

Journal of Power Sources (2025).

Ver

Production of Graphite Nanoplatelets via Functionalized Polyketone-Assisted Diels-Alder Chemistry: Evidence of Reduced Layer Thickness and Enhanced Exfoliation Efficiency.

Polymers (2025).

Ver

Copper-modified cellulose paper: a comparative study of how antimicrobial activity is affected by particle size and testing standards.

International Journal of Molecular Sciences, (2025).

Ver

Cu-paper: investigación, diseño y ciencia para la transformación de recursos locales en innovación global.

Universidad del Desarrollo. Facultad de Diseño (2025).

Controlled release of the anticancer drug cyclophosphamide from a superparamagnetic β -cyclodextrin nanosponge by local hyperthermia generated by an alternating magnetic field.

ACS Applied Materials & Interfaces, (2024).

Ver

Advances in the sustainable development of biobased materials using plant and animal waste as raw materials: a review.

Sustainability, (2024).

Ver

Upcycling Salmon Skin Waste: Sustainable Bio-Sequins and Guanine Crystals for Eco-Friendly Textile Accessories.

Recycling, (2024).

Ver

Fast and easy synthesis of silver, copper, and bimetallic nanoparticles on cellulose paper assisted by ultrasound.

Ultrasonics Sonochemistry. (2023).

Ver

Design and application of paper with copper particles with potential use as a surface barrier for fomite transmission.

The Little Book of Design for Health in Latin America (2023)

Ver

Synthesis and Characterization of Magnetite/Gold Core Shell Nanoparticles Stabilized with a β -Cyclodextrin Nanosponge to Develop a Magneto-Plasmonic System.

Magnetochemistry.(2023)

Ver

β -Cyclodextrin Nanosponges Inclusion Compounds Associated with Silver Nanoparticles to Increase the Antimicrobial Activity of Quercetin.

Materials (2023).

Ver

Review on Generation and Characterization of Copper Particles and Copper Composites Prepared by Mechanical Milling on a Lab-Scale.

Int. J. Mol. Sci (2023).

Ver

Nanomaterials Based on Honey and Propolis for Wound Healing—A Mini-Review.

Nanomaterials (2023).

Ver

Enhancing the electrocatalytic activity of Fe phthalocyanines for the oxygen reduction reaction by the presence of axial ligands: Pyridine-functionalized single-walled carbon nanotubes.

Electrochimica Acta (2021).

Ver

Mapping experimental and theoretical reactivity descriptors of Fe macrocyclic complexes deposited on graphite or on multi-walled carbon nanotubes for the oxidation of thiols: Thioglycolic acid oxidation.

Electrochimica Acta, (2021).

Ver

Oxide copper nanoparticles stabilized by acrylonitrile and methyl methacrylate polar monomers through a ligand exchange reaction.

Material Research Express (2021).

Ver

Correlation between the concentration and morphology of copper microparticles and their biocidal effect on paper sheets.

Cellulose (2020).

Ver

Modulation of the electrocatalytic activity of Fe phthalocyanine to carbon nanotubes: electrochemistry of L-cysteine and L-cystine.

Electrochimica Acta (2019).

Ver

Testing reactivity descriptors for the electrocatalytic activity of OPG hybrid electrodes modified with iron macrocyclic complexes and MWCNT for the oxidation of reduced glutathione in basic medium.

Russian Journal of Electrochemistry. (2019).

Ver



Dirección de Investigación

Facultad de Diseño
Universidad del Desarrollo

SCL | Av. Plaza 680, Las Condes

CCP | Ainavillo 456, Concepción

in | [linkedin.com/in/diseño-udd](https://www.linkedin.com/in/diseño-udd)

ig | @disenoudd

web | diseno.udd.cl/

Bibliografía

EquiMed - Horse Health Matters. (2023). *Results from the 2023 National Equine Economic Impact Study Released.*

<https://equimed.com/news/business/results-from-the-2023-national-equine-economic-impact-study-released>

Equine Business Association. (2023). *The Equine Industry: A Global Perspective.* <https://equine-businessassociation.com/equine-industry-statistics/>