

PORTFOLIO OF TECHNOLOGIES

# **UNIVERSITY OF CAUCA**



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# **Our mission**

The Universidad del Cauca is a public institution of higher education located in the city ofPopayán, capital of the department of Cauca, Colombia. It was created on April 24, 1827, by the President Francisco de Paula Santander, but its origins are in the Seminario Mayor de Popayán founded in 1609. In this university were educated several actors of the independence of Colombia such as Francisco José de Caldas and Camilo Torres. The ideas of independence and republican government were promoted in this institution. It currently has 9 faculties, outstanding medicine, electronic engineering and agricultural sciences. The university stands out for its research activities among the best public universities in Colombia.

The Division of Innovation, Entrepreneurship and Articulation with the Environment (known in Spanish as DAE) is a division of the Research Vice-Rectory of the University of Cauca. The Research Vice-Rectory is in charge of the System Research of the University. The Division articulates the University community related to Science, Technology and Innovation - CTeI and the environment, through the generation of interaction conditions and processes that contribute to the construction of relevant solutions for social, economic, cultural and environmental development of the region and the country.

The division promotes this portfolio of technologies in order to make known to society and enterprises, the resulting products from the research groups of the University of Cauca in such a way that they contribute to social, economic and environmental development.



Vicerrectoría de Investigaciones División de Innovación, Emprendimiento y Articulación con el Entorno - DAE



# The TRL

Technology **Readiness Levels** 

The purpose of Technology Readiness Levels (TRL) is to measure the maturity of technology components for a system. The measurement allows project personnel an understanding of how much development a certain technology needs before being utilized. A TRL rating helps in measuring the progress of a project.

#### **Technology Readiness Level (TRL)** Scale

TRL is based on a scale from 1 to 9 with 9 being the most mature technology. The use of TRLs enables consistent. uniform, discussions of technical maturity across different types of technologies. Decision authorities will consider the recommended TRLs when assessing program risk.

Through this portfolio it will be possible to see the level of technological maturity in which each research product is found.

#### Actual system has proven through successful mission operations

The actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples expected conditions. include using the system under operational mission conditions.

# development. Examples include developmental test weapon system to determine if it meets design specifications.

#### **Basic principles observed** and reported Lowest level of technology

readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.

#### **Technology concept** and/or application formulated

Actual system

completed and

of true system

and demonstration

proven to work in its

final form and under

Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.

#### System prototype qualified through test demonstration in an operational Technology has been environment Prototype near, or at, planned operational system. relevant environment In almost all cases, this Represents TRL represents the end a major step up from TRL 6. requiring the demonstration of an actual system and evaluations of the prototype in an system in its intended operational environment such as an aircraft, vehicle, or space.

A representative model or prototype system, which is well beyond that of TRL 5. is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness.



 $\bigcirc$ 

System/subsystem

model or prototype

demonstration in a

#### Analytical and experimental critical function and/or characteristic proof of concept

Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.

## TRL Scale

Component and/or breadboard validation in relevant environment The Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment.

#### **Component and/or breadboard** validation in lab environment

Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include the integration of "ad hoc" hardware in the laboratory.

# AGRICULTURE

- INSECTICIDAL CAPACITY OF GARLIC ON TECIA SOLANIVORA
- AGROECOLOGICAL SCHOOL FARM
- OBTAINING OF HYBRID BOMBYX MORI SILKWORM
- MOCLI: WEATHER MONITORING
  AND PREDICTION
- INFARMING: AGROPROTOTYPES

# INSECTICIDAL CAPACITY OF

#### TECHNOLOGY NAME: INSECTICIDAL CAPACITY OF GARLIC ON Tecia solanivora APPLIED ON POTATOE CROPS

Garlic is recognized for its biological and chemical properties and is used as antiba terial, antioxidant, fungicide, anticancer agent, among others. Compounds of Sulfur were extracted from its essential oils to be tested on *Tecia solanivora*, a moth that attacks the potato crops causing huge economic losses in Latin America every year.

The test obtained positive results determining benefits with up to 100% moth death in laboratory.

TRL Technology Readiness Levels

## 123456789

**Component** and/or breadboard validation in lab environment

#### Advantages:

- Natural insecticide.
- Effectiveness, reducing costs of agricultural inputs up to 40%.
- Economical, low toxicity and eco friendly.

#### Application area: Agriculture



Research Group: Biotechnology, Environmental Quality and Food Safety BICAMSA (In Spanish)

- Maite del pilar Rada Mendoza
- Diana María Chito Trujillo
- José Luis Arciniegas Herrera
- Fernando Hernández Blanco
- Victoria Galvis Calambás
- Paula Jaramillo Quevedo

# AGROECOLOGICAL SCHOOL FARM

The agroecological school farm is a dynamic process developed by rural coffee farmers in the department of Cauca, Colombia, which allows to improve the environmental, social and economic conditions of their territories by sharing diverse practices, principles and agroecological experiences, becoming a living school of local knowledge.

#### TRL Technology Readiness Levels

### 123454789 Technology demonstrated in relevant environment

#### Advantages:

- Self-sustaining farms.
- Productive model in harmony with Nature.
- Improvement of local enviroment.
- Coffee diversification and increase of incomes for farmers.
- Construction of social networks that add high value to products.

#### Application area: Agriculture



Research Groups: Interdisciplinary group ofcultural, economic and administrative research GICEA (In Spanish)

- Economic Thought, Society and Culture
- Investigation Group for Rural Development Tull (In Spanish)

#### १२ Researchers:

- Olga Lucía Cadena Durán
- Bernardo Tobar Quiliaquez
- Carlos Corredor Jiménez
- Gustavo Alegría Fernández





### HYBRID OF

# Bombyx mori

#### TECHNOLOGY NAME: OBTAINING HYBRID OF SILKWORM Bombyx mori

Double hybrid *Bombyx mori* silkworm has been obtained through processes of selection and crossing between Chinese and Japanese lines, achieving evidence of superior productive performance in 15 of 18 characteristics of economic and biological interest, evaluated and contrasted with current genetic material.

TRL Technology Readiness Levels

## 123456789

System model or prototype demonstration in operational environment

#### Advantages:

- Keeping and reproduction of genetic material in the department of Cauca.
- Adaptation of genetic material to agroecological conditions of the region.
- Hybrid with better performance for cocoon production, larger volumes of silk production and better quality.

Application area:

SISINPRO (In Spanish)



**Research Group:** Integrated systems of agricultural,

forestry and aquaculture production

#### **FR** Researchers:

- Ximena Ruiz Erazo
- Fredy Javier López Molina

## MOCLI: WEATHER MONITORING AND PREDICTION

MOCLI (acronym in Spanish for: "Monitoreo y predicción climática") is a technology dedicated to hydroclimatic monitoring and prediction, initially focused on the agricultural sector and other sectors for which the monitoring and prediction of hydrometeorological conditions allow adequate management of soils, crops, irrigation systems, and planning processes

related to climatic events. Seeking to ensure the greatest possible production through the analysis of information (maps, reports, bulletins, early warnings and recommendations) for decision making.

TRL Technology Readiness Levels

### 123456789 Technology demonstrated in relevant environment

#### Advantages:

- Reliable information for plots owners.
- Easy to use.
- Climate analysis and predictions in easy-to-understand language.
- Close to real time access platform.

- Application area: Agriculture
- Research Groups: Latin American Ethnobotanical Group GELA (In Spanish)
- Agrochemistry Group

- Fernando Muñoz Gómez
- Edier Humberto Pérez

## INFARMING: Agro prototypes

Web Platform that integrates four Modules: Disease costs, production estimation, disease management (dieback and coffee leaf rust) and nutrition management that allows producers to manage their crops based on machine learning algorithms for decision making.

#### TRL Technology Readiness Levels

## 123456789

System model or prototype demonstration in operational environment

#### Advantages:

- System based on rules and expert knowledge.
- Useful tool for early detection of diseases such as Rust and Dieback.
- Cost optimization for producers.
- Decision making based on precise data.
- Production Estimation.

#### Application area: Agriculture



Agriculture Research Group:

Telematics
 Engineering Group
 GIT (In Spanish)
 ECOTECMA S.A.S.

Software registration: 13-97-65 del 07-12-2023 13-97-67 del 07-12-2023 13 -97-83 del 07-12-2023 13-97-84 del 07-12-2023 13-97-85 del 07-12-2023

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- Gonzalo Ernesto Potosí
- Cristian Camilo Ordóñez

# ANIMAL FEEDING

NUTREINN - EXTRUDED CONCENTRATE FROM FISH VISCERAS

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SILKWORM PUPAE FLOUR FOR ANIMAL FEEDING

# NUTREINN

#### TECHNOLOGY NAME: NUTREINN, EXTRUDED CONCENTRATE FROM FISH VISCERAS

Nutreinn, is an extruded concentrate for animal feeding, made of hydrolyzed proteins with antioxidant and antimicrobial properties, obtained from fish visceras. Nutreinn is a substitute for fish meal, which is expensive and has a limited market access.

#### TRL Technology Readiness Levels

### 123456789 Technology demonstrated in relevant environment

#### Advantages:

• It improves conversion rate compared to concentrated feeds found on the market.

- Digestibility close to 95%.
- Reduction of production costs.
- Less use of antibiotics, due to presence of active peptides.
- Exploitation of fish by-products.

Application area: Animal feeding



**Research Group:** Exploitation of Agroindustrial by-products ASUBAGROIN (In Spanish)

Patent: N° NC2017/0003230

- José Luis Hoyos Concha
- Liliana Rojas
- Edier Gaviria Acosta



# SILKWORM **FLOUR**

Universidad del Cauca

#### TECHNOLOGY NAME: SILKWORM PUPAE FLOUR FOR ANIMAL FEEDING

Silkworm flour is obtained from the pupae, a by-product of its cocoon, which is subjected to a controlled drying and grinding process, thus obtaining a high nutritional value flour. It can be used for animal feeding, providing a sustainable management alternative to the sericulture producers.

TRL Technology Readiness Levels

### 123454789 Technology validated in relevant environment

#### Advantages:

- Profitability in production.
- 50% protein, with a good protein profile amino acids.
- 75% digestibility.
- Energy level of 35% represented in its lipid fraction.
- Nutritional potential comparable to other raw materials such as fish flour.

#### Application area: Animal feeding



Research Group: Integrated systems of agricultural, forestry and aquaculture production SISINPRO (In Spanish)

- Fredy López Molina
- Connie Grisales Muñoz

# FUNCTIONAL FOOD

- BIOCATALYST FOR OLIGOSACCHARIDES SYNTHESIS
- **EDULCO MIEL** 
  - DIFFERENTIAL MILL FOR OBTAINING PROTEIN FRACTION OF QUINOA



# OLIGOSACCHARIDES **SYNTHESIS**

#### TECHNOLOGY NAME: BIOCATALYST FOR OLIGOSACCHARIDES SYNTHESIS

The biocatalyst comprises one or more enzymes  $\beta$  galactosidases immobilized on a silica mesoporous support, used for the synthesis of oligosaccharides derived from lactitol (LaOS), with potential probiotic properties, and applicable to the improvement of industrial production of functional foods.

#### TRL Technology Readiness Levels

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## 123454789

**Component** and/or breadboard validation in lab environment

#### Advantages:

Optimizing of

oligosaccharides synthesis.

 Reusable biocatalyst, which generates lower costs and improvements in different food industry applications.

 Use of by-products from dairy industry.

#### Application area Functional food



#### Researchers

- Maite del Pilar Rada Mendoza
- Alfonso Ramírez Sanabría
- Diana María Chito Trujillo
- María del Mar Villamiel Guerra
- Antonia Montilla
- Yuri Barrios

Universidad del Cauca



# EDULCO MIEL

Edulco Miel, it is a product of low caloric content due to the natural incorporation of Steviosides in honey, obtained from Stevia rebaudiana, with all the benefits of conventional honey.

#### TRL Technology Readiness Levels

## 123454789

Component and/or breadboard validation in lab environment

#### Advantages:

- Strengthening of the beekeeping chain.
- Increases the number of individuals in the hive being beneficial for
- pollination.
- Maintenance of low honey production in winter conditions
- It has greater sweetening

Application area: Functional food

Research Group: Natural Products Chemistry

arch Group:

- Luis Alberto Lenis
- Ricardo Benítez Benítez
- Olga Lucía Cadena Durán

## MILL FOR QUINOA PROTEIN FRACTION

#### TECHNOLOGY NAME: DIFFERENTIAL MILL FOR OBTAINING QUINOA PROTEIN FRACTION

The Differential Mill is designed for the separation of quinoa germ and endosperm, with which a concentrated protein material is obtained with an exclusively physical medium that allows preserving the nutritional richness of the grain, guaranteeing greater biological value, lower production costs for obtaining the protein fraction.

#### TRL Technology Readiness Levels

## 123456789

System model or prototype demonstration in operational environment

#### Advantages:

- Better time efficiency for obtaining protein.
- Lower energy consumption.
- No polluting waste.
- Between 30 and 38% of obtained protein fraction from a grain of quinoa.
- 100% pure protein fraction, without residual flavor.

#### Application area: Functional food

### Resea

- Science and Technology of Biomolecules of Agroindustrial Interest CYTBIA (In Spanish)
- Product engineering and agroindustrial processes GIPA (In Spanish)

#### Patent: N° NC2022/0007575 (en trámite)

- Jesús Eduardo Bravo
- Diego Fernando Roa Acosta
- José Fernando Solanilla

# ENVIRONMENTAL

- SELECTIVE MEMBRANES FOR MINING INDUSTRY
- DEVICE AND BIOLOGICAL SYSTEM BASED ON A CLOSED AEROBIC BIOREACTOR
- OBTAINING A ABSORBENT RESIN FROM PINUS PATULA BARK

# SELECTIVE **MEMEBRANES**

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#### TECHNOLOGY NAME: SELECTIVE MEMBRANES FOR MINING INDUSTRY

Selective membranes for mining industry, are made up of organic polymers that act as extracting agent of metallic ions.

These membranes have been used in the extraction of gold and Au 3+ ion in presence of other metals ions such as (Cu 2+, Pb 2+, Ca 2+, Zn 2+, Fe 3+, Ni 2+ and Al 3+) showing results with extraction percentages close to 80% per cycle.

#### TRL Technology Readiness Levels

## 123454789

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Component and/or breadboard validation in lab environment

#### Advantages:

- Polymeric material as a solution of contamination by metals.
- Membrane can be reuse for up to 3 extraction cycles without appreciable losses of
- efficiency.
- Ecological, less toxic.
   Economic, lower energy consumption.





Research Group: Electrochemical processes research group GIPEL (In Spanish)

- Germán Cuervo Ochoa
- Tania Gutiérrez
- Denis Gabriel Córdoba

# AEROBIC **REACTOR**

Universidad del Cauca

#### TECHNOLOGY NAME: DEVICE AND BIOLOGICAL SYSTEM BASED ON A CLOSED AEROBIC BIOREACTOR

This device is a biological system to decontaminate wastewater with Cyanide and Pseudomonas sp., in a bioreactor. In conjunction with other devices, this reactor carries out the decontamination process of the Cyanide present in waters from the mining industry.

#### TRL Technology Readiness Levels

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## 123454789

Component and/or breadboard validation in lab environment

#### Advantages:

- Easy and practical system to implement.
- Requires less use of chemicals to wastewater decontamination.
- It can process from small to large amounts of sewage.
- Systems very easy to adapt to other processes.

**Application area:** Environmental



Research Group:

Research Group in Metallurgical Engineering, mining and processes GIMPRO (In Spanish)

**Patent:** N° NC2018/0012300

- Katherym Bambague
- Willfrand Pérez
- Sandra Carlina Rivas
- José Luis Narváez



# ABSORBENT **RESIN**

#### TECHNOLOGY NAME: OBTAINING A ABSORBENT RESIN FROM Pinus patula BARK

The resin of *Pinus patula* is an absorbent material, obtained from the bark of this tree, through a process of extraction and subsequent synthesis organic, thus generating a resin with a high degree of absorption to some heavy metals such as: hexavalent chromium, mercury, lead and gold, which are used in a wide variety of industries.



#### TRL Technology Readiness Levels

## 123454789

Component and/or breadboard validation in lab environment

#### Advantages:

- Alternative for water decontamination.
- Greater removal of hexavalent chromium in comparison with activated
   carbon.
- Solve the problem related to the disposal of Pinus patula
- bark, residue from wood industry.
   Eco-friendly alternative for gold extraction.

#### Application area: Environmental

#### Research Group: Research Group i

Research Group in Metallurgical Engineering, mining and processes GIMPRO (In Spanish)

Patent: N° NC2018/0007542

- José Gallo Corredor
- Rodrigo Andrés Sarria Villada
- Katherine Alegría Córdoba

# BIODEGRADABLE

- COMPOSITION AND MANUFACTURING PROCESS OF THERMOSHRINKABLE FILMS FROM STARCH
- BIODEGRADABLE BAG FOR SEEDLINGS
- PROCESS FOR OBTAINING FLEXIBLE BIODEGRADABLE FILMS
- BIODEGRADABLE DISPOSABLE PLATE
- BIODEGRADABLE FILMS FOR FOOD CONSUMPTION GLOVES
- COMPOSITION AND MANUFACTURING PROCESS OF THERMOPLASTIC FOAM FROM STARCH

# THERMOPLASTIC FOAM

#### TECHNOLOGY NAME: COMPOSITION AND MANUFACTURING PROCESS OF THERMOPLASTIC FOAM FROM STARCH

Thermoplastic foams are obtained from the protein mixture plasticized vegetable, thermoplastic starch, acid polylactic acid, a foaming agent and a nucleactng agent environmental friendly.

This foamed material can be used for the elaboration of packaging elements that serve for the manipulation and transport of products prone to damage due to the action of mechanical forces such as containers and containers containing chemical substances, electronic equipment, porcelain, among other objects.

#### TRL Technology Readiness Levels



#### Advantages:

- High expansion.
- Stable cells over time.
- The presence of the protein helps accelerate the biodegradation of polylactic acid.
- Starch composition between 51% to 57% w/w of the thermoplastic foam.

#### Application area: Biodegradable

#### **Research Group:**

Science and Technology of Biomolecules of Agroindustrial Interest CYTBIA (In Spanish)

**Patent:** N° NC2020/0015106

#### ----

#### Q Researcher

- Héctor Villada Castillo
- Alcy Cerón Mosquera
- Pedro Alban Bolaños
- José Solanilla Duque

Universidad del Cauca

# BIODEGRADABLE BAGS

#### TECHNOLOGY NAME: BIODEGRADABLE BAG FOR SEEDLINGS

Biodegradable seedling bag is made from a flexible film obtained from mixtures of starch cassava, plasticizer, polylactic acid (PLA) that incorporate a novel color concentrate or biodegradable masterbatch.

#### TRL Technology Readiness Levels

123456789 Technology demonstrated in relevant environment

#### Advantages:

 Biodegradation under compostable conditions approx. in 45 days.
 Producers avoid removal at the time of carry out the

the time of carry out the transplant to the final crop, which means, time savings.

 Compared to non-woven or counterparts in cellulose, have greater resistance, lower price, and take up little space in warehouse.

## **Application area:** Biodegradable



Research Group: Science and Technology of Biomolecules of Agroindustrial Interest CYTBIA (In Spanish)

**Patent:** - N° 16004103

#### ेट्रे Researcher

ATTEN I

- Héctor Villada Castillo
- 🗕 Diego Joaqui Daza
- Pedro Alban Bolaños
- German Arboleda Muñoz
- Jhon Palechor Trochez

# FLEXIBLE BIODEGRADABLE

Universidad del Cauca

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#### TECHNOLOGY NAME: PROCESS FOR OBTAINING FLEXIBLE BIODEGRADABLE FILMS

Biodegradable flexible films are obtained from mixtures of cassava starch, plasticizer, acid polylactic and polycaprolactone, which can be used for packaging food and nuts, among



TRL Technology Readiness Levels

> 123456789 Technology demonstrated in relevant environment

#### Advantages:

 Reduction of environmental impact.
 Adequate coefficient of permeability, which prevents the proliferation of fungi on packed fruit. **Application area:** Biodegradable

## **\***

Research Group: Science and Technology of Biomolecules of Agroindustrial Interest CYTBIA (In Spanish)

Patent: № 11124719 № 11-2014-0060081 (Brazil)

- Héctor Villada Castillo
- Juan Pablo Castañeda
- Diana Navia Porras

## FLEXIBLE BIODEGRADABLE DISPOSABLE PLATE

The biodegradable disposable plate is made from a composite material molded from a mixture of cassava flour and fique fiber, which incorporates a new coating based on a hydrocolloid material, bee wax, glycerol and polysorbate 80, which can be used as a ontainer for food preparations including fast foods, bakery and pastry products, fruits, seeds, pots, vases, among other types of products from the gardening and nursery industry.

#### TRL Technology Readiness Levels

Universidad

### 123456789 Technology demonstrated

in relevant environment

#### Advantages:

- Biodegradable food container.
- Disposable semi-rigid compound.
- It delays the transfer of unwanted moisture in food products.

#### Application area: Biodegradable

### Research Group:

Science and Technology of Biomolecules of Agroindustrial Interest CYTBIA (In Spanish)

### 🗿 Ра

Patent: N° NC2018/0014376

N° 16004093 N° 11-2014-006001 (Brazil - under process)

- Héctor Villada Castillo
- Karen Delgado Muñoz
- Elsa Cajiao Buitrón
- Alcy Cerón Mosquera
- Camilo Montilla Buitrago
- Juan Pablo Castañeda
- Diana Navia Porras

# biodegradable **FILMS**

#### TECHNOLOGY NAME: BIODEGRADABLE FILMS FOR FOOD CONSUMPTION GLOVES

Biodegradable gloves for food consumption are made to from cassava starch and polylactic acid through a reactive extrusion process in a single stage, followed by a blowing method to Obtaining biodegradable films and subsequent sealing in glove shape.



TRL Technology Readiness Levels

### 123456789 Technology demonstrated in relevant environment

#### Advantages:

- Biodegradable.
- Lower environmental
  - impact.
- Flexible and smooth.

Application area: Biodegradable

## \*

Research Group: Science and Technology of Biomolecules of Agroindustrial Interest CYTBIA (In Spanish)

**Patent:** N° 16004096

#### Researchers:

- Héctor Villada Castillo
- Karen Delgado Muñoz
- Camilo Montilla Buitrago
- Giovanni Varona Beltrán

Universidad del Cauca

# THERMOSHRINKABLE FILMS

Universidad del Cauca

#### TECHNOLOGY NAME: COMPOSITION AND MANUFACTURING PROCESS OF THERMOSHRINKABLE FILMS FROM STARCH

Shrink films are are made of dry starch, a plasticizer, a mixture of polymers biodegradable, an initiating agent and an agent couplant. These films can be used in the development of secondary packaging, thermo shrinkable labels or security seals.

#### TRL Technology Readiness Levels

### 123456789 Technology demonstrated in relevant environment

#### Advantages:

- Biodegradable films.
- Raw materials of
- natural origin.
- Less waste generation.

#### Application area: Biodegradable

#### Research Group:

Science and Technology of Biomolecules of Agroindustrial Interest CYTBIA (In Spanish)

### **P**

Patent: N°. NC2020/0015107

#### Researchers

- Héctor Villada Castillo
- Karen Delgado Muñoz

WH FB CHTSH

- Elsa Cajiao Buitrón
- Alcy Cerón Mosquera
- Camilo Montilla Buitrago
- Juan Pablo Castañeda
- Diana Navia Porras

# COSMETICS

DESIGN AND ELABORATION OF CANNABIS COSMETICS PRODUCTS

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# AEROBIC **REACTOR**

#### TECHNOLOGY NAME: DESIGN AND ELABORATION OF CANNABIS COSMETICS PRODUCTS

Non-psychoactive cannabis-based medicinal products have been designed with different technological mechanisms guaranteeing that biologically active molecules can transfer their properties to their users, thus providing a true solution to the problems that afflict them.

#### TRL Technology Readiness Levels

## 123456789

Component and/or breadboard validation in lab environment

#### Advantages:

 Approved quality controls in 23 analysis of (THC), (CBD) and (CBN) according to resolution 1216 of 2016, Article 28. (colombian law)

- Morphological and photochemical characterization.
- Under FDA regulatory requirements.

### Cosmetics



Research Group: Chemistry of Natural products QPN (In Spanish)

0

- Ricardo Benítez Benítez
- Paola Arango Romero
- Jaime Marín Franco



# TECHNOLOGIES FOR EDUCATION

VIDEO CONTENT MANAGEMENT AND DISTRIBUTION PLATFORM

INTERACTIVE EDUCATIONAL SOFTWARE FOR SEMANTIC LANGUAGE STIMULATION

CHILD PROGRAMMING

# VIDEO CONTENT MANAGEMENT

Universidad del Cauca

#### **TECHNOLOGY NAME: VIDEO CONTENT MANAGEMENT AND DISTRIBUTION PLATFORM**

The management and distribution platform for videos integrates a system wich is aware of the context User - Device - Net - Service. This system follows the IPTV OTT (Over the Top) profile defined by the OIPF (Open IPTV Forum).

VI 2331.MOV IV

fx



123456789 **Technology demonstrated** in relevant environment



- Customized content planner.
- Integration of services in the video.
- Quality of experience.
- Pseudo-design patterns for educational interfaces supported by video.
- It takes advantage of the context metadata.



**Research Group: Telematics Engineering Group** 

Patent: N° NC2020/0015106

- Rodrigo Cerón Martínez
- Mary Carrascal Reyes
- José Arciniegas Herrera



# SEMANTIC STIMULATION

Universidad

#### TECHNOLOGY NAME: INTERACTIVE EDUCATIONAL SOFTWARE FOR SEMANTIC LANGUAGE STIMULATION

This educational and interactive software is an instrument for stimulating the semantic oral language in children. It provides the therapist with activities organized according to several types of contents designed to achieve visual and auditory stimulation goals, allowing the children improves their language acquisition.

TRL Technology Readiness Levels 123456789 System model or prototype

demonstration in operational environment

#### Advantages:

- It improves 3 5 years old children linguistic competence.
- It facilitates the overcoming of semantic difficulvies.
- Support therapist's intervention.

**Application area:** Technologies for education



Software registration: N° 13-73-208 04/22/2019

- Miriam Ivonne Campo Sarzosa
- Isabel Muñoz Zambrano

## CHILD PROGRAMMING

Universidad del Cauca

Child Programming is a model for support team building software created by children, strengthening the dimension collaboratively, to increase the quality of learning and promote the acquisition of knowledge of children through their interactions during software development. In addition, it has some extensions: transactive memory, gender, debugging, collaboration and gamification.

om\_settings(cls, settings)
ebug = settings.getting
eturn cls(job\_dir(set))

TRL Technology Readiness Levels

### 123456789 **Technology demonstrated** in relevant environment

#### Advantages:

method

- It favors collaboration over individual development.
- Projects learning based.
- Supported by computer science fundamental concepts.
- Development of computational thinking.

#### **Application area:** Technologies for education



**Research Group:** Group of Research and **Development in Software** Engineering **IDIS (In Spanish)** 

#### **Researchers:**

César Collazos Ordóñez

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- Julio Hurtado Alegría
- René Zúñiga
- Isabel Mejía
- Bvron Salazar
- Ricardo Muñoz
- Ana María Chimunja

ENERGY

METERING INFRASTRUCTURE SUPPORTED BY MONITORING SYSTEM

CARBONOUS MATERIAL OBTAINED FROM WASTE AGROINDUSTRY

# ADVANCED **METERING**

Universidad

#### TECHNOLOGY NAME: ADVANCED METERING INFRASTRUCTURE SUPPORTED BY A SYSTEM FOR MONITORING THE CONNECTION STATUS OF METERS TO THEIR RESPECTIVE TRANSFORMER

The system allows to manage the demand of electrical consumption, through reading, cutting and reconnection of electricity meters of users; addinionally it manages loss of electricity monitoring the connection status of energy meters to their elecrical transformer initially assigned, detection and reporting of meters that are being fed by different transformers or have changed the feeder transformer of the initially assigned and its subsequent report to the network operator through a web platform or a mobile application.

TRL Technology Readiness Levels

> 123456789 System model or prototype demonstration in operational environment

#### Advantages:

- Management of demands and losses for electrical distribution networks.
- Carbon Footprint Reduction.
- Identification of customer consumption profile.
- Low cost, without forcing users to modify their conventional electricity meters.

#### Application area: Energy



Research Group:
Industrial Automatic
Western Power Company CEO (In spanish)

#### ेट्रे Researchers:

- Eduardo Castillo Castillo
- Eileen Pineda Calvache
- Yamir Bolaños Muñoz
- Juan Flórez Marulanda
- Pablo Magé Imbachí
- Carlos Rengifo Rodas
- Harold Romo Romero

# CARBONOUS **MATERIAL**

#### TECHNOLOGY NAME: CARBONOUS MATERIAL OBTAINED FROM WASTE AGROINDUSTRY

Carbonaceous material with electrical and chemical properties that can be used as catalyst in the chemical industry and as conductive material in the energy industry. It is obtained from the pyrolysis of waste from the coffee agroindustry.

#### TRL Technology Readiness Levels

37

## 123454789

**Component** and/or breadboard validation in lab environment

#### Advantages:

- Use of agro-industrial waste from coffee.
- Eco-friendly production process.
- Material with electrical and chemical properties.

Application area: Energy



### Researchers: Alfonso Ramírez Sanabria

- Cristian Miranda Muñoz
- José Hoyos Concha
- Luisa Ramos Riascos
- Andrés Pacheco Pacheco

# CIVIL ENGINEERING

PLASTICITY CHART WITH OPTICAL SPREADING



# PLASTICITY **CHART**

#### TECHNOLOGY NAME: PLASTICITY CHART WITH OPTICAL SPREADING

This equipment uses the technique of optical scattering to obtain a correlation with the plasticity chart of a fine ground (traditional sorting technique), by processing the amount of radiation transmitted. It allows the direct classification of the type of ground, considerably reducing the test times necessary for the classification of the ground sample.



TRL Technology Readiness Levels

### 123454789 Technology validated in relevant environment

#### Advantages:

- Reduction of test times.
- Better accuracy of samples evaluation.
- High repeatability in evaluations.
- Easy operability of the equipment.
- Portable technology.

**Application area:** Civil Engineering

### Research Groups:

- Road Geotechnics and Pavements
   GEPAV (In Spanish)
- Optics and Laser Research Group GOL (In Spanish)

- Eugenio Chavarro
- Mario Patiño
- José Penagos
- Yule Jaime Obando Ante

# HEALTH

ZOE - OPTICAL METHODS OF ILLUMINATION OF BIOLOGICAL SAMPLES

Sig VIRM - SYSTEM FOR REMOTE MONITORING OF HOSPITALIZED PATIENTS AT HOME

NEUROMOTIC - SYSTEM OF SUPPORT AND DIAGNOSIS OF EPILEPSY

ANTI-INFLAMMATORY AND ANTICOAGULANTS OF NATURAL ORIGIN

LOWER LIMB PROPRIOCEPTIVE ASSESSMENT SYSTEM

# ZOE optical method

#### TECHNOLOGY MANE: ZOE - OPTICAL METHODS FOR ILLUMINATING BIOLOGICAL SAMPLES

ZOE is an optical method for illuminating biological samples dyed or not, with the ability to output any color from the visible range. It is able to maximize the contrast of regions of interest of the sample, through automatic color calculation, which means a better observation and evaluation of histopathological samples, becoming a new tool for medical diagnosis.





#### TRL Technology Readiness Levels

## 123454789

**Component** and/or breadboard validation in lab environment

#### Advantages:

 It decreases observation times.

- It improves the quality in the observation of histopathological samples and the contrast of images.
- It improves the user experience for the viewer.
  It offers more diversity of colors in comparison with the

three conventional filters.

Application area: Health

**Research Group:** 

## <u>\*</u>

Research Group in Dynamic Systems, Instrumentation and Control SIDICO (In Spanish)

Patent: N° NC2018 / 0007279

- Rubiel Vargas Cañas
- Jorge Cortes Fernández
- Jairo Vásquez López

# SIG Virm

Universidad del Cauca

#### TECHNOLOGY NAME: SYSTEM FOR REMOTE MONITORING OF HOSPITALIZED PATIENTS AT HOME

Sig ViRM, is a system to monitor remotely some vital signs of patients with hospitalization at home such as: blood oxygen saturation, body temperature, systolic and diastolic blood pressure, and heart rate. The system makes use of equipment approved by the FDA and/or INVIMA (the colombian institution that control the correct use of medicines), consists of an application for smart phones with Android operating system (for caregiver access) and a web application (for caregiver and Helth Center access).

TRL Technology Readiness Levels

## 123454789

Component and/or breadboard validation in lab environment

SIEVIRM

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#### Advantages:

- It allows to know the health status of a patient in real time anywhere in the world.
- It is safe for the patient.
- It includes an alert system through text messages on WhatsApp and email for the caregiver.
- Easy to use.

#### **Application area:** Health



Research Group:
 Research Group
 in Dynamic Systems,
 Instrumentation and
 Control

SIDICO (In Spanish)



- Rubiel Vargas
- Eimmer Imbachi

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# NEURO Motic

#### TECHNOLOGY NAME: NEUROMOTIC, SYSTEM OF SUPPORT AND DIAGNOSIS OF EPILEPSY

The core of the system NEUROMORTIC is a electronic health record (EHR) and a service of telehealth, platform-based OpenMRS that together with a intelligent component allows to automatically detect abnormal segments on electroencephalography tests, using machine learning algorithms.

#### TRL Technology Readiness Levels

123454789 Technology validated in relevant environment

#### Advantages:

- Quick diagnosis of epilepsy.
- Integrated into Tele-neurology Service.
- Detect Polypoints.
- Reduces interpretation time of
- electroencephalography.
- Allows visualizing abnormal segments in electroencephalography signals.

#### Application area: Health

#### Research Groups:

 Telematics Engineering
 Research Group in Dynamic Systems, Instrumentation and Control SIDICO (In Spanish)

#### Patent: N° NC2018/0007279

#### Software registration: N° 13-77-235 (12/26/2019) N° 13-77-164 (12/04/2019) N° 13-77-377 (01/24/2020)

- Diego López Gutiérrez
- Rubiel Vargas Cañas
- 🗕 🌔 María Miño Arango
- Ricardo Salazar Cabrera
- Camilo Sarmiento Torres
- 🗕 Edward Molina Rivera
- Maritza Mera Gaona



# NATURAL anti-inflammatory

#### TECHNOLOGY NAME: ANTI-INFLAMMATORY AND ANTICOAGULANTS OF NATURAL ORIGIN

The ethanolic extract of the plant *Piper auritum* considerably inhibits edema and coagulation caused by the poison of the snake *Bothrops rhombeatus,* opening the possibility of apply this activity not only in the ophidian accident, but also as a broad-spectrum anti-edema and an anticoagulant for problems such as thrombi.



#### TRL Technology Readiness Levels

## 123454789

Component and/or breadboard validation in lab environment

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#### Advantages:

- Generation of a new anti-edema and anticoagulant.
- Anti-edema and anticoagulant of natural origin from an abundant source.

#### Application area: Health



Research Group: Herpetological and Toxicological Research Group GIHT (In Spanish)

- Angie Marcela Rengifo Ríos
- Luis Miguel Muñoz Gómez
- Fabio Antonio Cabezas
- Jimmy Guerrero Vargas

# PROPRIOCEPTIVE ASSESSMENT **SYSTEM**

Universidad del Cauca

45

#### **TECHNOLOGY NAME:** LOWER LIMB PROPRIOCEPTIVE **ASSESSMENT SYSTEM**

It is an evaluation and functional instrument oriented towards rehabilitation, which allows evaluating the proprioceptive system of athletes to improve the diagnosis of musculoskeletal injuries and thereby obtain an dynamic monitoring of the rehabilitation process.



TRL Technology Readiness Levels

### 123454789 **Technology validated in** relevant environment

#### Advantages:

Diagnosis of the proprioceptive system in lower limbs.

- It allows monitoring of musculoskeletal injuries.
- It improves sports training and the rehabilitation process.





**Research Group:** Health and Human Motricity **Researcher:** Nancy Janneth Molano Tobar

# **Contac us**

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