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15 Constantin Daicoviciu street
400020, Cluj-Napoca, România
e-mail: liliana.pop@staff.utcluj.ro

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Title

INNOVATIVE USE OF SHEEP WOOL AND POLYURETHANE FOAM FOR OBTAINING MATERIALS WITH SOUND-ABSORBING PROPERTIES

Inventor/s - Contact OVIDIU NEMEŞ, SIMONA IOANA BORLEA (MUREŞAN), ANCUŢA-ELENA TIUC, GYORGY DEAK Ovidiu.Nemes@imadd.utcluj.ro

## Patent/ Application number

Patent OSIM no.: R0136050- B1/30.05.2024

#### Short presentation

The aim of this work was to obtain materials with sound-absorbing properties using sheep wool and rigid bicomponent polyurethane foam. Four materials with three layers were obtained. A layer of sheep wool previously processed by hot pressing at 80°C and 5 MPa, with final thicknesses of 2, 4, 6 and 12 mm; a layer of polyurethane foam, with a thickness of 8....37 mm and a transition layer, 1...20 mm thick, resulting from the migration of polyurethane foam during the multilayer panel manufacturing process into the wool layer and/or the migration of wool into the polyurethane foam layer. Wool and polyurethane foam are the combination of sound insulation and sound absorption - wool absorbs sound and reduces it, and due to the rigid structure of polyurethane foam (closed pore structure), it does not allow sound to travel further, resulting in sound insulation.

The obtained materials have very good sound absorption properties with acoustic absorption coefficient values over 0.7 for the frequency range 800 ÷ 3150 Hz; the results prove that the sheep wool has a comparable sound absorption performance to that of mineral wool.

#### Applicability

The study explores alternative usage of sheep wool as a construction material with improved sound absorbing properties beyond its traditional application as a sound absorber in textile industry or using of waste wool in the textile industry as a raw material. Sound absorbing materials can be used to reduce noise and to obtain an adequate acoustic for enclosed spaces. They can have many uses, both outdoors and indoors: in industry, commercial areas, relaxation and leisure areas, in areas used for education, in constructions, on building sites, highways, roads and streets, airports, ports, railways, etc. Materials studied in this research can be used to reduce noise impact, as decorative panels with sound absorbing role, to improve acoustic conditions, and to reduce or stop reverberations.

## Images



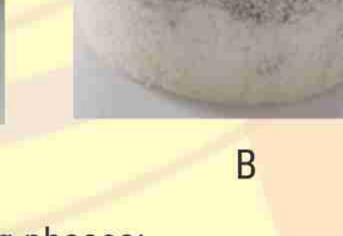


Fig.1. Processing phases:
A: Phase I - Wool plate hot formed;
B: Phase II - Finale structure of the plate

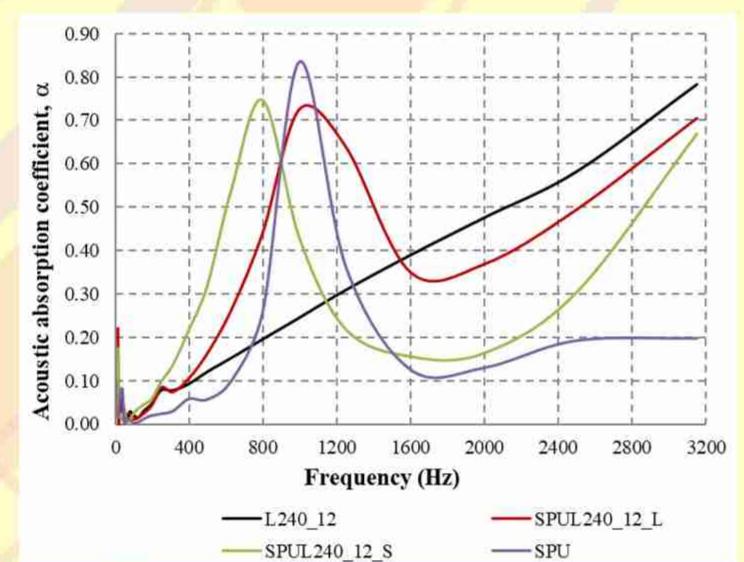


Fig. 2. Variation in the acoustic absorption coefficient with frequency for multi-layer materials in comparison with rigid polyurethane foam (SPU) and the layer made of pressed sheep's wool (L240\_12).





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15 Constantin Daicoviciu street
400020, Cluj-Napoca, România
e-mail: liliana.pop@staff.utcluj.ro

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# Title Studies and research about obtaining natural fiber-based eco-materials

Inventor/s - Contact Oana-Roxana LĂPUŞAN (HANDABUŢ), Ovidiu NEMEŞ, Ana Maria JEFLEA

# Patent/ Application number

Project "EcoNFCs"

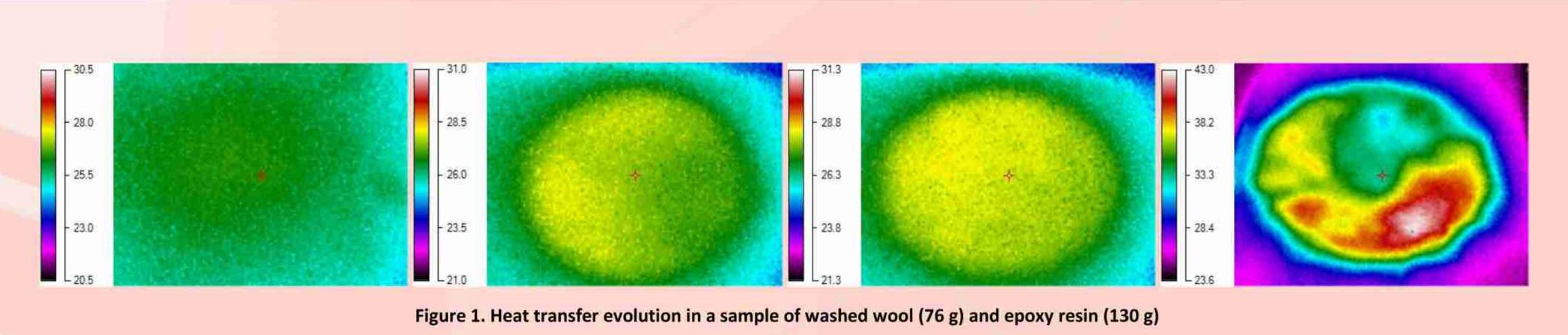
# Short presentation

Natural Fiber Composites (NFCs) are gaining prominence as sustainable, eco-friendly, and cost-effective alternatives to composite materials. Utilizing renewable resources like flax, jute, hemp, wool, and bagasse, these composites offer advantages such as biodegradability. Despite their benefits, NFCs face challenges, primarily the natural fibers' tendency to absorb moisture (hydrophilicity) and their poor adhesion to common hydrophobic polymer matrices. These issues can compromise the material's performance and durability. To overcome these limitations, various surface treatments are researched, including chemical, plasma, and biological methods, as well as the use of coupling agents or nanofillers. These modifications aim to enhance the bond between fibers and the matrix, thereby improving mechanical properties, thermal insulation, and wear resistance.

Specific fibers offer distinct advantages, such as flax's high stiffness and wool's excellent insulation and fire retardancy. Hybrid systems combining different fibers show potential by leveraging complementary characteristics. Continued innovation in treatments, design, and durability assessment is essential for promoting wider adoption of these sustainable materials, particularly for more demanding uses.

# Applicability

The specific properties inherent to natural fibers facilitate their deployment in a wide spectrum of industrial applications. In the automotive industry, they function as components in dashboards and interior panels, as well as reinforcement materials in composites, contributing to vehicle weight reduction, enhanced fuel efficiency, and decreased CO2 emissions. The construction sector employs natural fibers to improve the mechanical characteristics of cementitious materials and for sound attenuation in acoustic applications. Furthermore, their biocompatibility and non-toxic nature permit their use in biomedical contexts, including drug delivery matrices, tissue engineering frameworks, and orthopedic devices. Finally, natural fibers remain integral to the textile industry for the production of sustainable fabrics, nonwovens, and apparel.









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Title

PRoHep-LCT- PARALLEL ROBOT FOR LAPAROSCOPIC TREATMENT OF HEPATIC TUMORS

Inventor/s - Contact

Plitea Nicolae, Pîslă Doina Liana, Vaida Liviu Călin, Gherman Bogdan George, Tucan Paul George Mihai E-mail: Doina.Pisla@mep.utcluj.ro

Patent/ Application number
Patent OSIM no.: R0134189- B1/30.10.2024

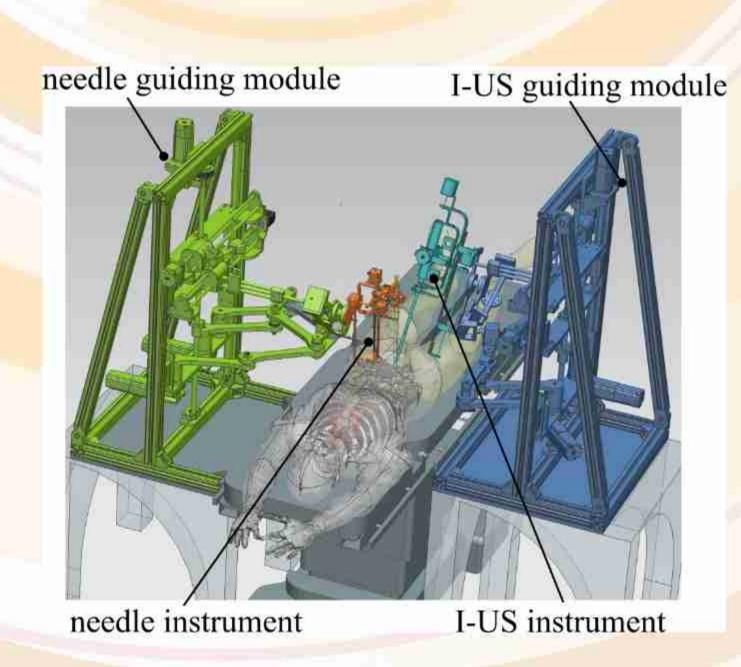
### Short presentation

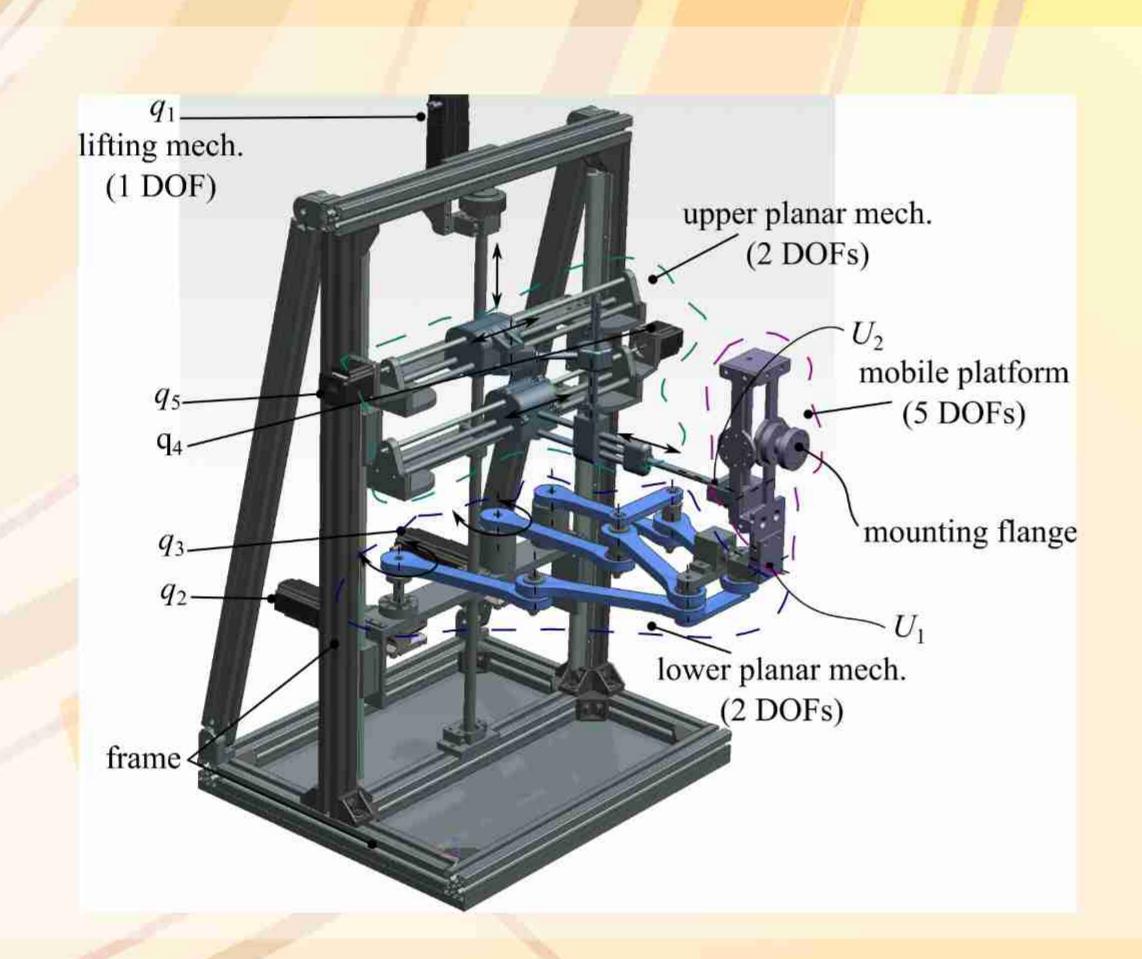
The invention relates to a parallel robot for laparoscopic treatment of unresectable liver tumors. According to the invention, the robot consists of two robotic modules: the intra-operatory ultrasound (I-US) guiding module is designed for guiding a hepatic ultrasound probe in the operating field; the needle guiding module is designed for guiding and inserting brachytherapy needles in hepatic tumors (which are localized using I-US). Each robotic module has five degrees of freedom and are placed on a common frame which is fixed on the patient's bed. Furthermore, both parallel robotic modules consist of two parallel mechanisms, one with three degrees of freedom and is used for positioning an automated medical instrument (to manipulate a hepatic ultrasound probe, or for brachytherapy needle insertion), and the second mechanism with two degrees of freedom for the automated instrument orientation. The parallel robotic system for hepatic cancer treatment is controlled by the surgical staff using a master console located in the operating room.

#### Applicability

Medical robotics, Cancer treatment, Brachytherapy, Intra-tumoral drug release.

### Images











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400020, Cluj-Napoca, România
e-mail: liliana.pop@staff.utcluj.ro

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Title

AUTOMATED MEDICAL INSTRUMENT FOR INSERTING MULTIPLE NEEDLES ON LINEAR AND PARALLEL TRAJECTORIES IN INTERSTITIAL BRACHYTHERAPY CANCER TREATMENT

Inventor/s - Contact

Gherman Bogdan, Bîrlescu Iosif, Burz Alin, Pisla Doina E-mail: Doina.Pisla@mep.utcluj.ro

Patent/ Application number

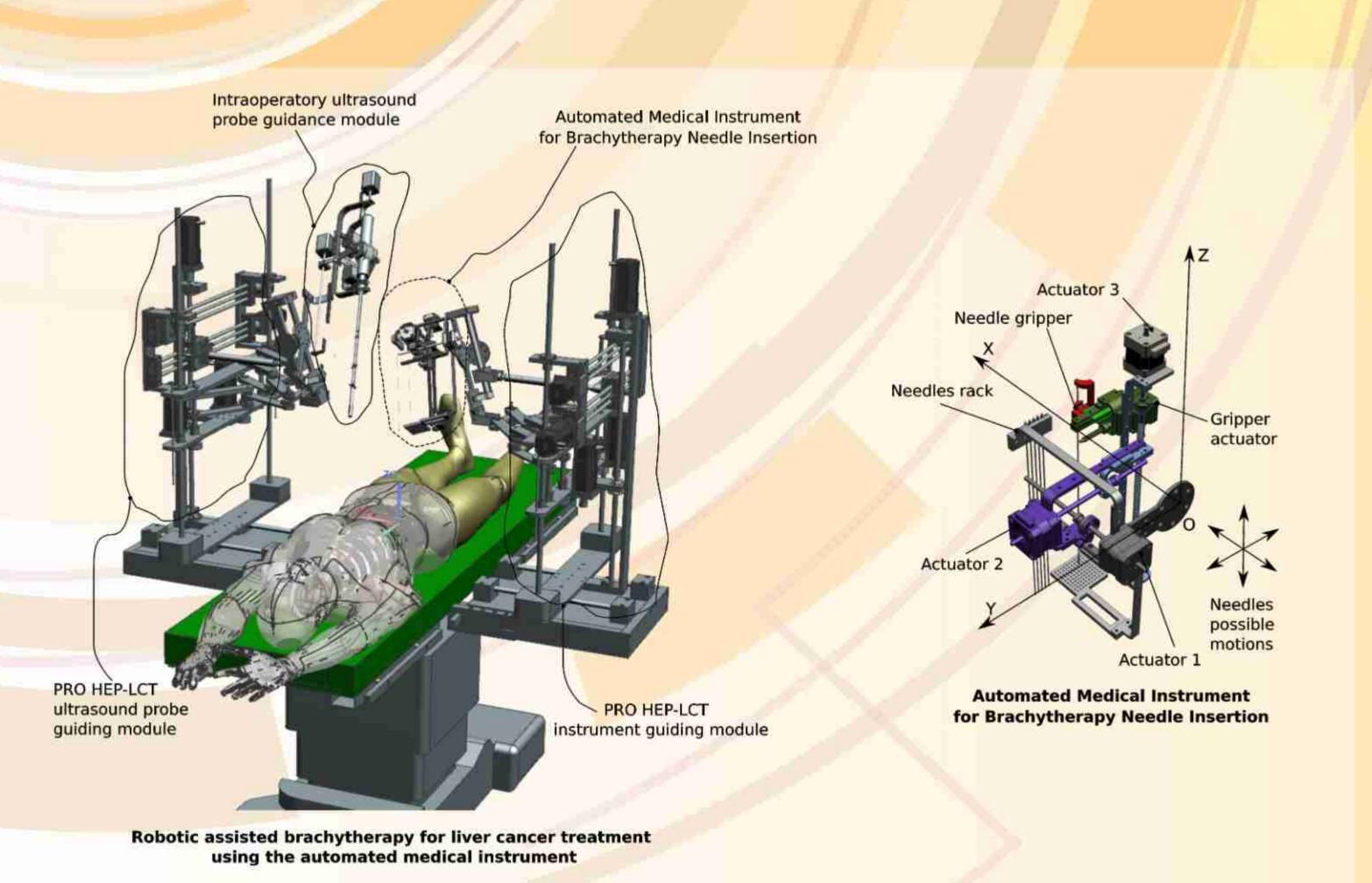
Patent OSIM no.: R0134941- B1/30.10.2024

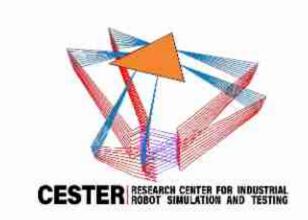
# Short presentation

The present innovation is a medical robotic instrument designed to insert percutaneously multiple needles on a straight trajectory in brachytherapy procedures for liver cancer treatment. The instrument has 3 degrees of freedom, having a serial kinematic chain of type PPP and a specially designed gripper. It uses Gantry architecture to position the brachytherapy needle in the XOY plane, using the actuators 1 and 2. The brachytherapy procedure usually requires the precise placement of up to 6 brachytherapy straight needles inside the tumor in a matrix form (which helps avoiding needles collisions), using the actuator 3, at a distance of 10mm from each other (both on OX and OY axes). The size of the treated tumors determines directly the required number of the needles. These are taken from the needles rack, which is attached to the robotic instrument, one by one using the needle gripper, which is designed specifically for this application. The first needle is placed (approximately) in the middle of the tumor, followed by the others, using the pre-planned trajectories. The robotic instrument can also be used for intratumoral drug release.

# Applicability

Medical robotics, Cancer treatment, Brachytherapy, Intra-tumoral drug release.











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400020, Cluj-Napoca, România
e-mail: liliana.pop@staff.utcluj.ro

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#### Title

### INTELLIGENT ROBOTIC SYSTEM WITH 3D NAVIGATION SYSTEM FOR ORAL SURGERY

### Inventor/s - Contact

Doina-Liana Pîslă(UTCN), Cristian Mihail Dinu (UMFCJ), Paul-George-Mihai Tucan (UTCN), Rareș-Cristian Mocan (UMFCJ), Călin Liviu Vaida (UTCN), Vasile-Nicolae Bulbucan (UTCN), Daria Pîsla (UMFCJ), Mihaela-Carmen Hedesiu (UMFCJ)

### Patent/ Application number

Patent application OSIM no.: A/00581/30.09.2024

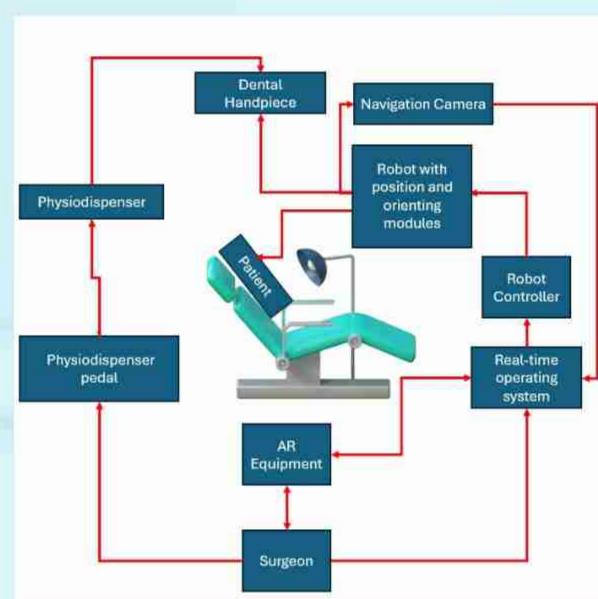
#### Short presentation

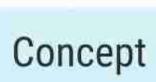
The present invention describes an intelligent robotic system that works together with an advanced 3D navigation system to perform oral surgery with increased precision and efficiency. The invention consists of an intelligent robot having at least six degrees of freedom, responsible for manipulating the dental handpiece during the procedure. This operation is based on commands from the process controller and a real-time operating system. The system also includes a stereo vision camera and 3D navigation system used to provide real-time three-dimensional imaging of the surgical site. These images enable the dynamic generation of trajectories for the robot's end effector that controls the dental handpiece. Additionally, the robot controller transmits the real-time motion parameters from the operating system ensuring continuous updates through the 3D navigation system. The surgeon oversees the entire procedure and can intervene as necessary. Using augmented reality equipment, the surgeon can simulate the surgical process, previewing the handpiece trajectory, receiving patient status updates, making fine trajectory adjustments, recording the procedure, and virtually placing the dynamic surgical guide. All these functions use the preoperative CBCT images and the real-time 3D navigation system, enabling active adjustments during the medical procedure, including compensating for the patient's head movements.

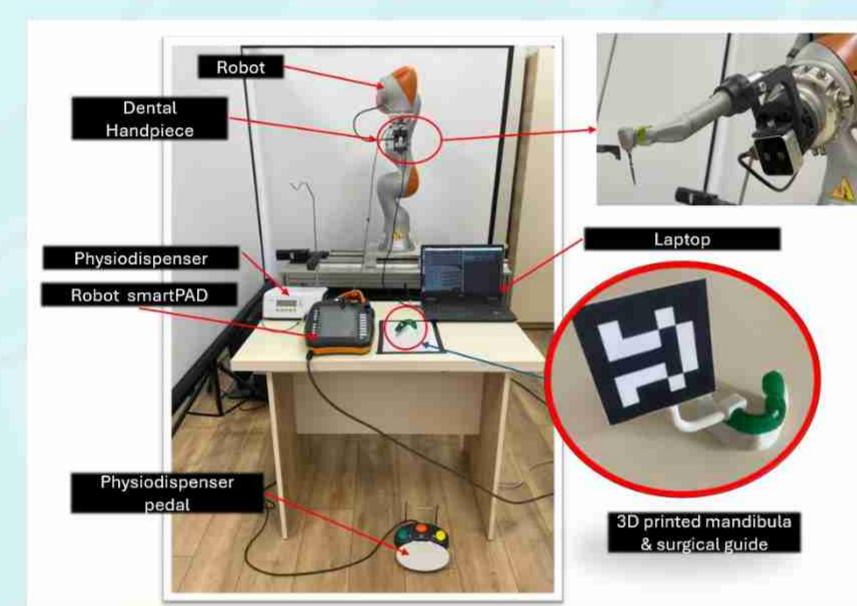
#### Applicability

The specific applicability of the intelligent robotic system with 3D navigation system for oral surgery from the present invention is robotic-assisted oral surgery, a medical procedure that has proven multiple advantages over classic, manual surgery such as: higher precision, ergonomics, reduced risk of damage to adjacent tissues, reduction of human errors, optimal post-operative evolution and maximization of the implant lifetime. The intelligent robotic system with 3D navigation for oral surgery represents a significant advancement in the field of oral surgery, combining cutting-edge technologies to provide more precise, safe, and effective treatments. This transforms the way oral surgical interventions are performed, bringing benefits for both doctors and patients.

## Images







Prototype







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e-mail: liliana.pop@staff.utcluj.ro

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# Title

# PARALLEL ROBOT FOR RECOVERY OF LOWER LIMB JOINTS IN TWO PLANES

# nventor/s - Contact

Pîslă Doina Liana, Bîrlescu Iosif, Vaida Liviu-Călin, Tucan Paul- George-Mihai, Gherman Bogdan George, Machado Jose.

Doina.Pisla@mep.utcluj.ro

# Patent/ Application number

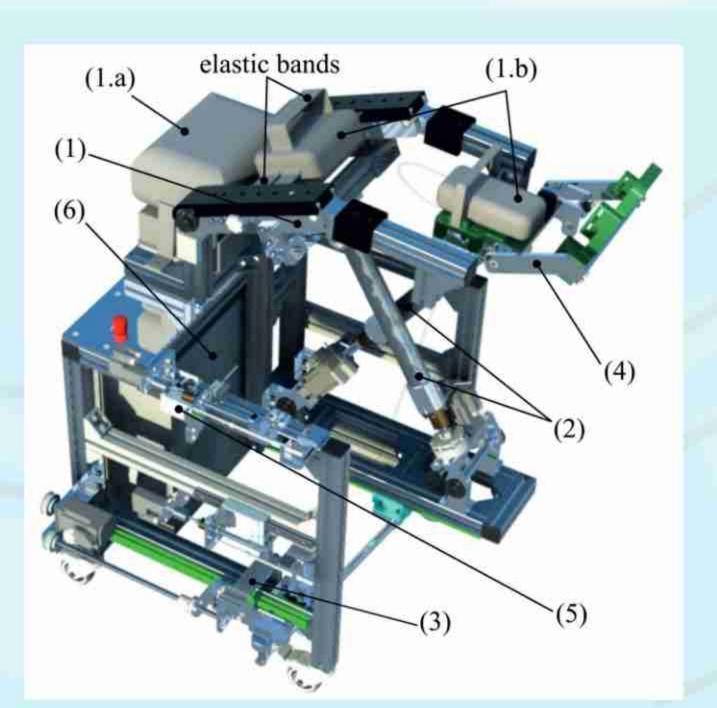
Patent application OSIM no.: A/00116/20.03.2024 & Portuguese Institute of Industrial Property (INPI) no.: 20252006789500

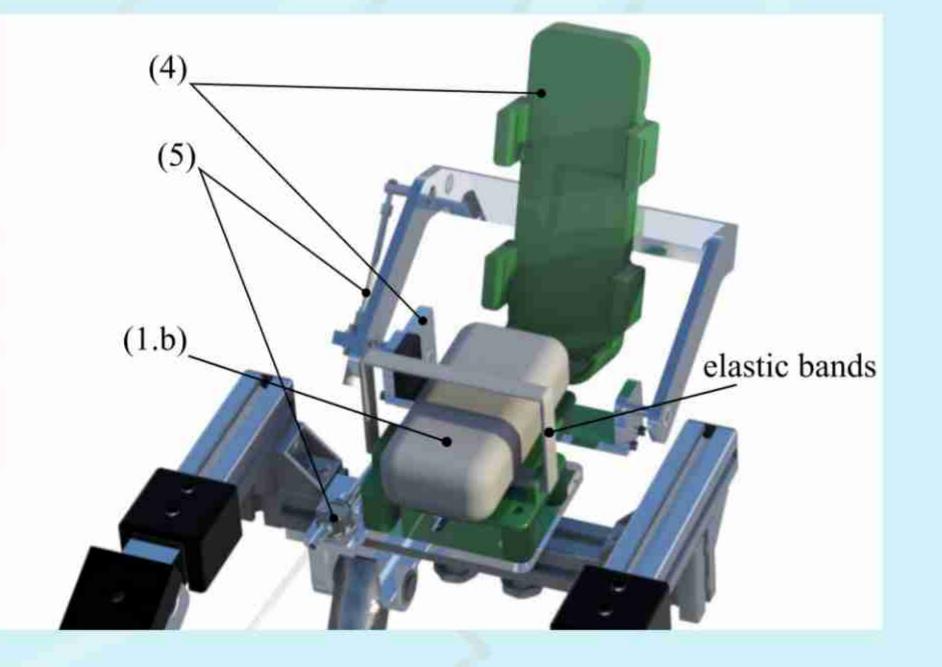
# Short presentation

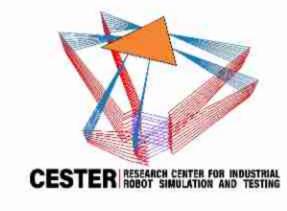
The invention relates to a parallel robot for the medical recovery of patients with neuromotor disorders of the lower limb. The robotic system (the subject of the invention) consists of two parallel, and coupled, robotic modules enabling the neuromotor rehabilitation of the lower limb in two planes. The first module (the hip and knee rehabilitation module HKM) is designed for the hip and knee neuromotor rehabilitation allowing the motions of flexion/extension of the hip and knee joints, and the abduction/adduction of the hip joint. The second module (the ankle rehabilitation module AKM) is designed for the ankle neuromotor rehabilitation allowing the motions of plantar flexion/extension and inversion/eversion. The HKM is composed of: a guiding kinematic chain (1), on which the lower limb is placed on pads (1.a, 1.b) and held using elastic bands; HKM is a serial kinematic chain with three passive revolute joints (RRR), which is guided by three input kinematic chains, two identical revolute-prismatic-revolute (RPR) chains (2), providing the flexion/extension motions for the hip and knee joints, and one prismatic-revolute-prismatic (PRRP) chain (3), providing the motions of abduction/adduction of the hip joint. The AKM is composed of: a guiding kinematic chain (4), where the foot is placed, which is a serial kinematic chain with two passive revolute joints (RR), and two identical input kinematic chains (5) of type revolute-prismatic-revolute (RPR) which provide the ankle motions.

# Applicability

The invention domain of applicability refers to the neuromotor rehabilitation of the lower limb for patience suffering from different neuromotor afflictions such as: stroke, Parkinson disease, sclerosis (different forms), spinal cord injury. The robotic system from the present invention can be adopted in neuromotor rehabilitation centers, together with specialized patient-focused medical protocols, to help the medical personnel in rehabilitating the patients such that the patients can continue a normal life and be able to perform the daily life activities.











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### Title

## **AUTOMATED SURGICAL INSTRUMENT FOR ROBOTIC-ASSISTED MINIMALLY INVASIVE SURGERY**

#### Inventor/s - Contact

Pîslă Doina Liana, Chablat Damien, Bîrlescu Iosif, Vaida Liviu-Călin, Pușcă Alexandru-Vasile, Tucan Paul-George-Mihai, Gherman Bogdan George.

Doina.Pisla@mep.utcluj.ro

#### Patent/ Application number

Patent application OSIM no.: A/00142/29.03.2024 & French Patent and Trademark Office (INPI-Institut national de la propriété industrielle) no.: FR2414038

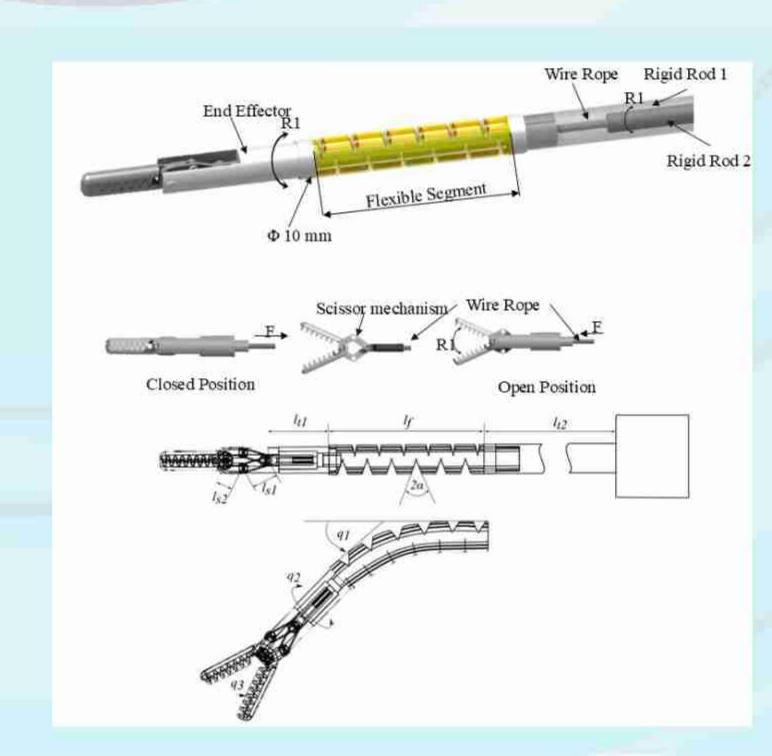
#### Short presentation

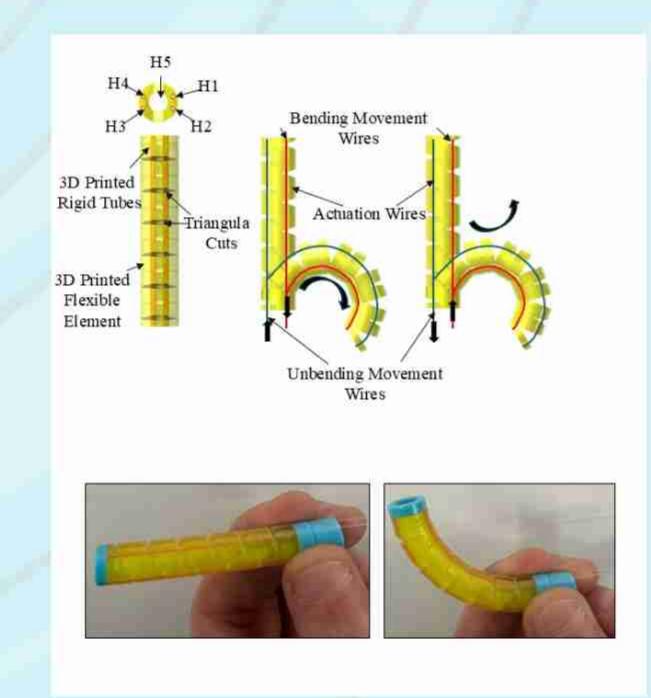
The present invention refers to an automated surgical instrument with high dexterity for minimally invasive robotic assisted surgery. The surgical instrument has 5 Degrees of Freedom (DoFs) for the active head (end-effector) of the surgical instrument (e.g., clips, scissors, dissector, etc.) to ensure high dexterity and easy access in difficult areas of the operating field. High dexterity is ensured by integrating a rotation in the distal area, at the level of the active head and easy access to the operator field is ensured by the controlled curvature of the instrument rod in the distal portion. The flexible segment of the instrument rod is manufactured using 3D printing and elastic materials with special geometry. Moreover, the surgical instrument within the present invention has decoupled motions which leads to increased rigidity, necessary for the manipulation of tissues in the operating field and the conduct of the surgical procedure. The surgical instrument within the present invention is designed to be mounted on serial or parallel robotic surgical systems with 6 degrees of freedom capable of maintaining a fixed point of insertion of the instrument in operator field and containing a module with the motors to actuate the 5 degrees of freedom of the instrument. Consequently, the surgical instrument does not contain sensitive electronic elements and can be sterilized by various techniques (chemical or ionizing radiation), being also more efficient as cost of production and use.

#### Applicability

The domain of applicability of the present invention refers to the robotic assisted minimally invasive surgery. The automated instrument can be equipped with various surgical tools (e.g., clips, scissors, dissector, etc.) to perform the required surgical task. The present invention is designed to be manipulated by a surgical robotic system to facilitate ergonomics and surgical intervention precision, which in turn improve the outcome of the surgical act.

### Images











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400020, Cluj-Napoca, România
e-mail: liliana.pop@staff.utcluj.ro

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# Title

# PARALLEL ROBOTIC SYSTEM FOR MINIMALLY INVASIVE PANCREATIC SURGERY

# Inventor/s - Contact

Vaida Liviu-Călin, Gherman Bogdan George, Tucan Paul- George-Mihai, Bîrlescu Iosif, Chablat Damien, Pîslă Doina Liana.

Doina.Pisla@mep.utcluj.ro

# Patent/ Application number

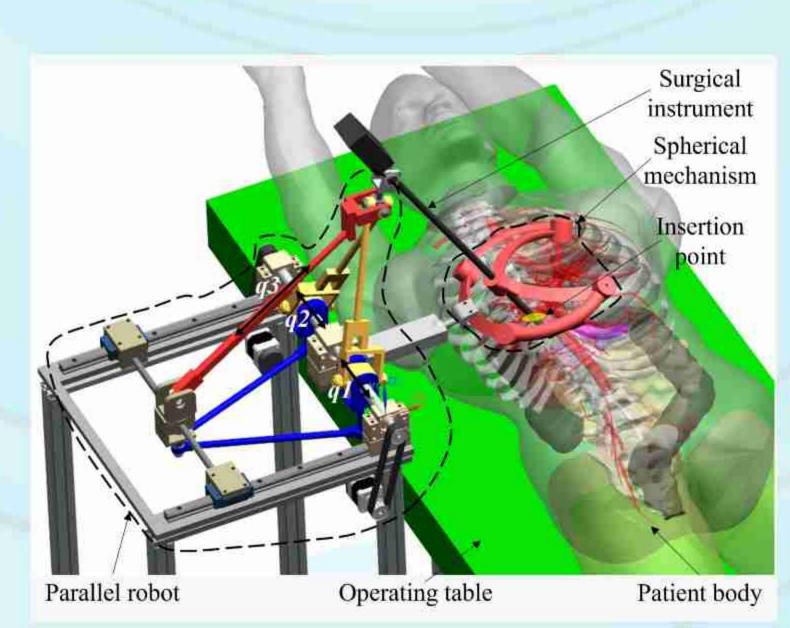
Patent application OSIM no.: A/00522/11.09.2024 & French Patent and Trademark Office (INPI-Institut national de la propriété industrielle) no.: FR2414265

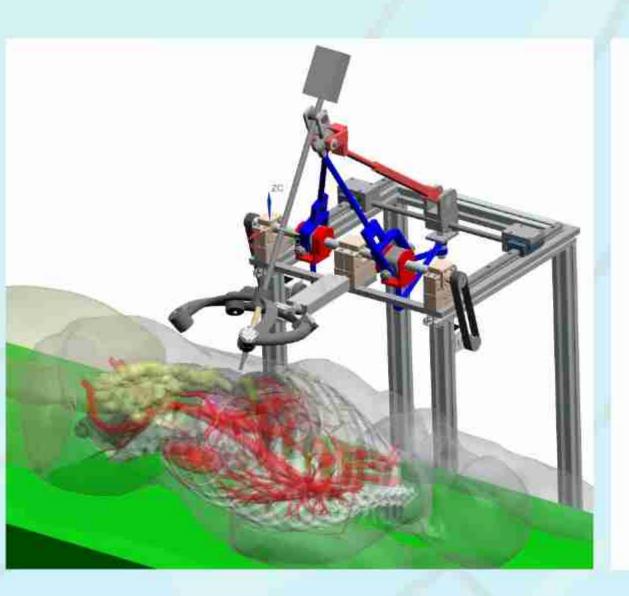
# Short presentation

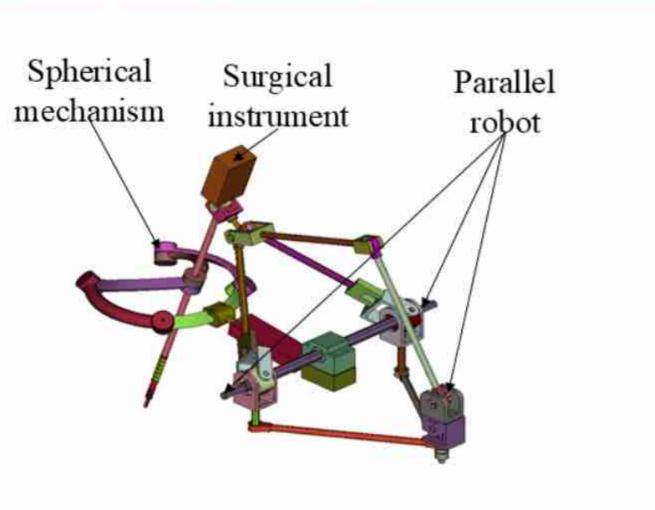
The present invention refers to a parallel and modular robotic system for minimally invasive surgery (MIS) of the pancreas. The robotic system is designed to assist the main surgeon in various MIS tasks and to replace the second surgeon in the operating room. The main surgical tasks of the modular parallel robotic system are manipulating active surgical instruments (staplers, scissors), manipulating the laparoscopic camera, manipulating retractors. The robotic system consists of three modules, namely: (1) an innovative parallel robot with 3 Degrees of Freedom (DOFs) that manipulates a surgical instrument; (2) a spherical parallel mechanism which constraints the surgical instrument in a Remote Center of Motion (RCM) type of motion (where the surgical instrument has three orientations with respect to the insertion point in the surgical field and one translation fir the instrument insertion/retraction); (3) the surgical instrument which is manipulated by the parallel robot (1) and constrained at the insertion point by the spherical mechanism (2) to avoid trauma. The specific advantages of the robotic system proposed for minimally invasive surgery of the pancreas are high accuracy and rigidity (characteristics of parallel robots that increase patient safety during the medical act), modularity, reduced footprint in the operating room and increased ergonomics (features that ease medical intervention for surgeons).

# Applicability

The domain of applicability of the present invention refers to the robotic assisted minimally invasive pancreatic surgery and targets the accurate manipulation of various surgical instruments (staplers, scissors, laparoscopic camera, etc.). The present invention aims to replace the second surgeon in the operating room, to facilitate ergonomics and surgical intervention precision, which in turn improve the outcome of the surgical act.









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Title

SHEEP WOOL BASED MODULAR PANEL AND THE METHOD USED FOR OBTAINING IT

#### Inventor/s - Contact

DÉNES Tünde-Orsolya, TĂMAȘ-GAVREA Daniela-Roxana, IŞTOAN Raluca, TIUC Ancuţa Elena, MANEA Daniela Lucia, VASILE Ovidiu

#### Patent/ Application number

Patent OSIM no.: R0135991- B1/30.05.2024

#### Short presentation

The invention relates to a modular panel based on sheep wool fibers, and the method of obtaining it, in order to meet the requirements of quality in construction regarding noise protection and the sustainable use of natural resources. Each module consists of a triple layered panel, having a composition similar to that of sandwich panels. The structure of the layered panel is made of two outer layers of hydrated lime-based plates, which delimit a mattress made of sheep wool fibers placed between them.

The weighted sound reduction index of the modular panel is Rw (C;Ctr) = 38 (-2, -8) dB.

The layered panels have high sound absorption coefficient values at low frequencies. The maximum value is 0.90 at the frequency of 524 Hz.

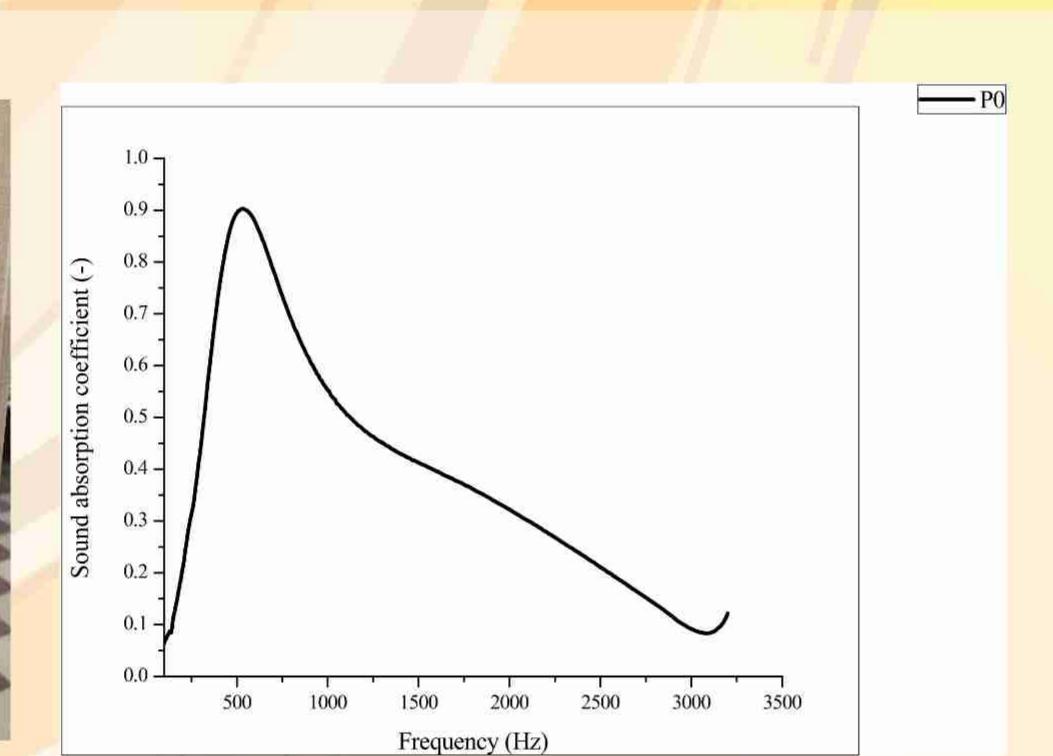
## Applicability

The invention consists in obtaining of a modular panel for vertical partition walls in buildings, with acoustic and thermal properties comparable to the existing sound insulating, sound absorbing and thermal insulating composites by using sheep wool, which is a viable natural alternative to synthetic fibers.

## Images



Modular panel



Variation of sound absorption coefficient





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400020, Cluj-Napoca, România
e-mail: liliana.pop@staff.utcluj.ro

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# Title

ECOLOGICAL ROAD CONCRETE BASED ON CEMENT, GLASS POWDER AND AGGREGATES FROM RECYCLED CONCRETE WASTE FOR APPLICATIONS IN THE FIELD OF CONSTRUCTIONS "Bcr\_g"

# nventor/s - Contact

CORBU Ofelia-Cornelia; PUSKAS Attila

# Patent/ Application number

Patent OSIM no.: R0137345- B1/30.07.2024

# Short presentation

The road concrete of the invention is an environmentally friendly concrete composed of natural aggregates (NA), recycled concrete aggregates (RCA) and waste glass powder form (WGP) that replaces part of Portland cement, RCA and WGP as an alternative to conventional materials. The concrete design was carried out so that, in addition to other durability characteristics, a remarkable resistance to abrasion was obtained. It falls into the resistance class BcR5. The microstructure and compositional characteristics of the concrete were also investigated, to confirm the efficiency of WGP. This new composite offers several advantages in terms of reducing existing and potential volumes of mineral waste both economically and visually, reducing pollution and minimizing the consumption of natural resources and energy. By applying it in the construction industry, it makes it possible to move from a linear economy to a circular economy.

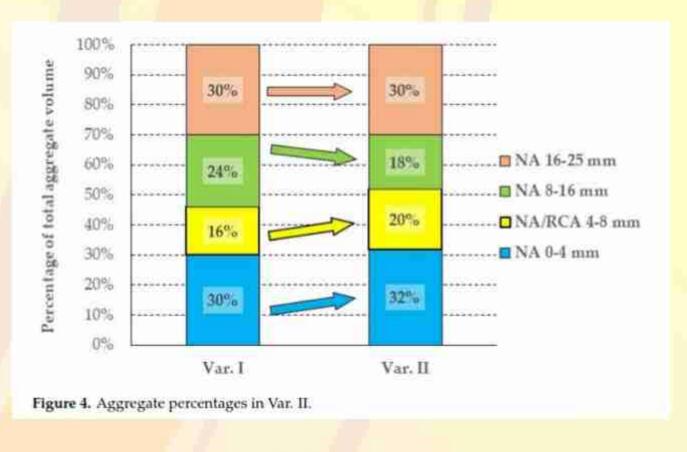
# Applicability

Application in the construction field with applicability for roads, sidewalks, pavements, alleys, etc

# Images







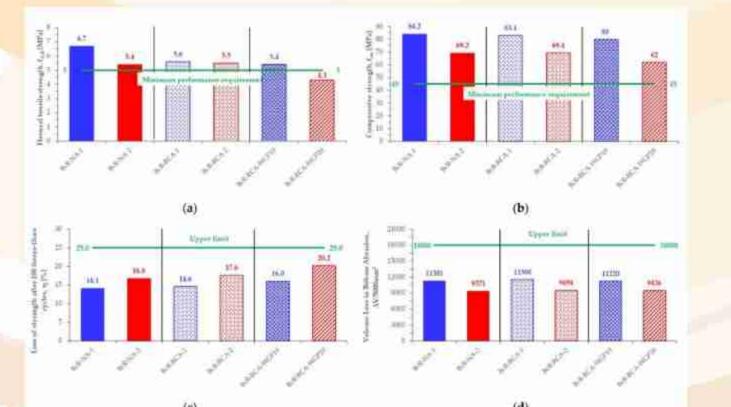


Figure 23. Hardened BcR composites' properties (both variants);

(a) flexural strength, (b) compressive strength;

(c) loss of strength after 100 freeze-thaw cycles;

(d) volume loss in Böhme abrasion.

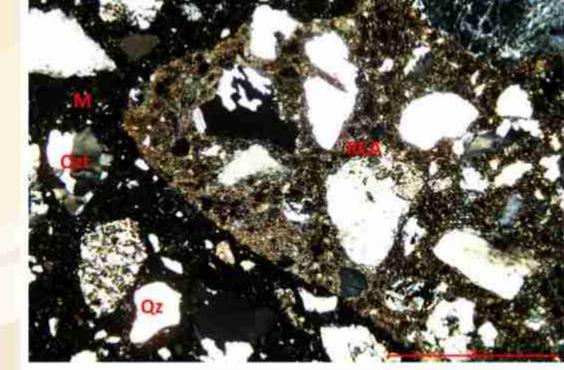


Figure 15. Microscopic image of the sample BcR-RCA-WGP10 at crossed pollars with porphyroclastic texture. The clasts consist of recycled concrete (RCA), quartzite (Qzt), fragments of quartz, etc. embedded into the matrix, black in color. The scale bar is 1 mm.

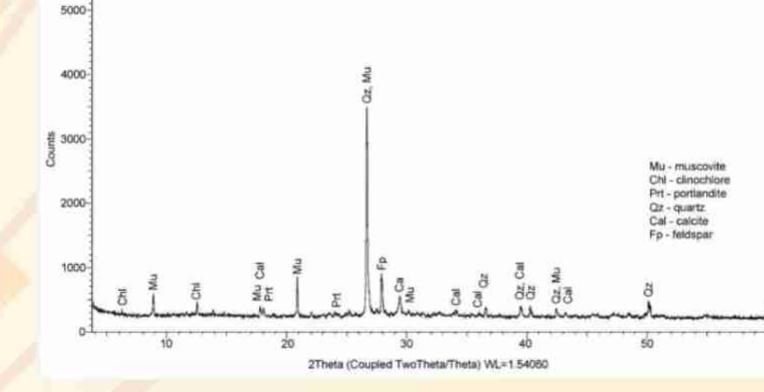


Figure 18. The X-ray spectra of the sample BcR-NA-1 with the typical line for quartz, muscovite, calcite, albite, clinochlore, gypsum, portlandite, and orthoclase.

[1] Coatings 2023, 13(10), 1710; https://doi.org/10.3390/coatings13101710



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## Title

# PROCESS OF MANUFACTURING CUSTOMIZED MULTI-STRUCTURE MEDICAL IMPLANTS BY ADDITIVE MANUFACTURING TECHNOLOGIES

### Inventor/s - Contact

Leordean Vasile Dănuț <sup>a,\*</sup>, Radu Sever-Adrian <sup>b,\*</sup>, Cosma Sorin-Cosmin <sup>c,\*</sup>, Cuc Stanca <sup>d</sup>, Vilău Cristian <sup>e,\*</sup>, Rusu Mircea-Aurelian-Antoniu <sup>f,\*</sup>

- \* Technical University of Cluj-Napoca, Machine Building Faculty, Department of Manufacturing Engineering
- a) dan.leordean@tcm.utcluj.ro, b) adrian.radu@tcm.utcluj.ro, c) cosmin.cosma@tcm.utcluj.ro,
- d) stancabobo@yahoo.com, e) cristian.vilau@tcm.utcluj.ro, f) Mircea.Rusu@tcm.utcluj.ro

#### Patent/ Application number

Patent OSIM no.: R0132908- B1/28.02.2024

#### Short presentation

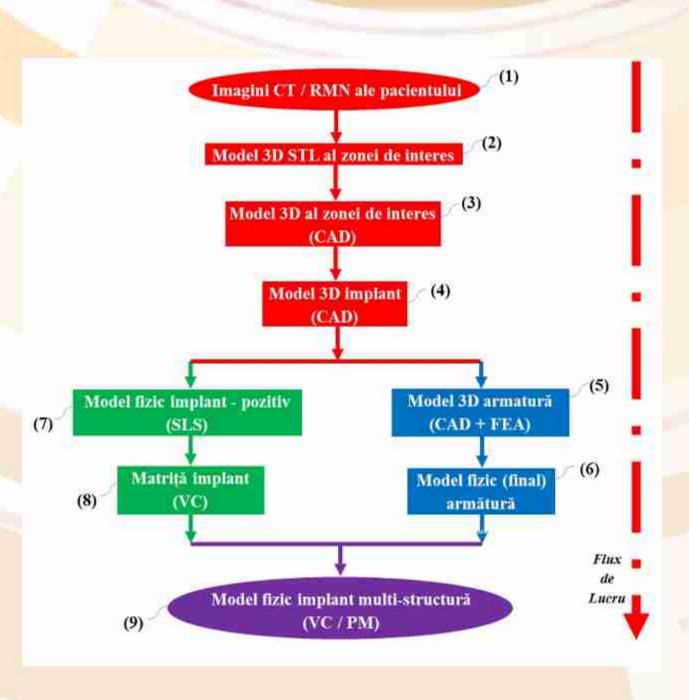
The invention is related to the development of a process (technology) for manufacturing customized implants made of biocomposite material, reinforced with metallic structures produced by SLM. The resulting multi-structure implants (metal/biocomposite) are tailored to individual patients and can be used to prosthesis any area of the human bone system. The process is based on CT data from which the 3D model of the affected area is extracted. The final shape and resistance structure (metal reinforcement) of the future implant will be designed using CAD and FEA programs.

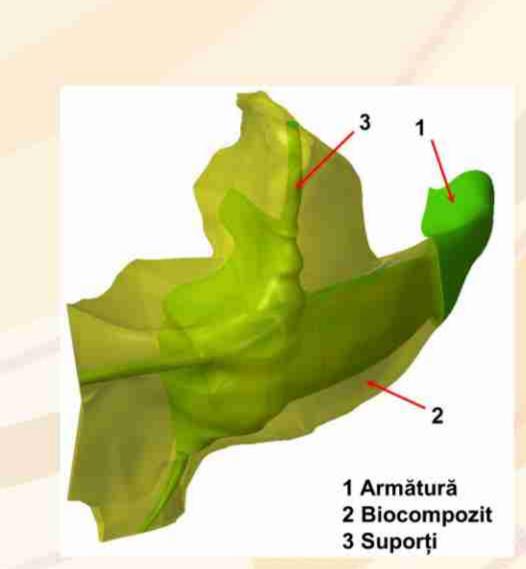
The manufacturing process consists of two stages. In the first stage, two AM technologies are used: SLM is employed to create the metal reinforcement, while SLS and Vacuum Casting are used to produce the silicone rubber mold that will shape the final implant. In the second stage, the reinforcement is placed into the silicone mold, and the final customized implant is created through casting or injection, depending on the material composition.

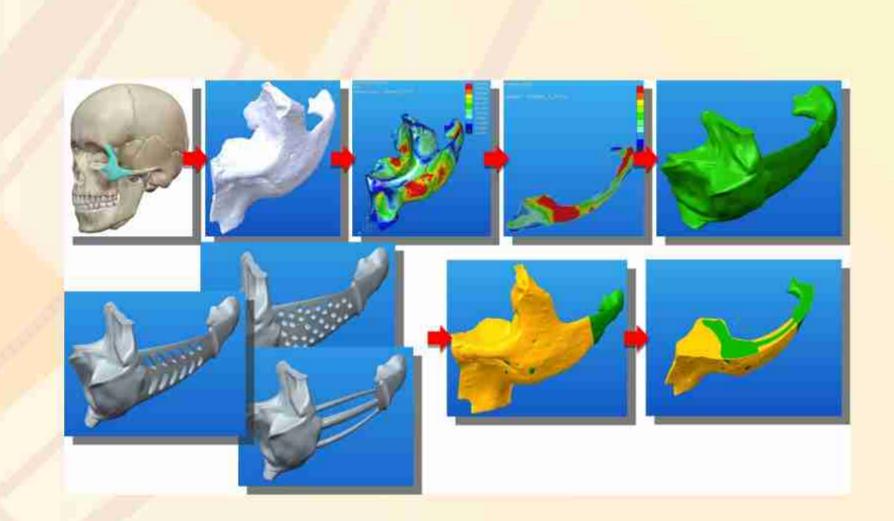
#### Applicability

Medical applications, Medicine

### Images











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Knowledge and Technological Transfer Center

15 Constantin Daicoviciu street
400020, Cluj-Napoca, România
e-mail: liliana.pop@staff.utcluj.ro

www.utcluj.ro

# Title DE ALCONA MUTIL O CANA

# BRAKING MECHANISM WITH S CAM

Inventor/s - Contact
Laze Daniel / danut.laze@yahoo.com; syntiumsm@yahoo.com

# Patent/ Application number

Patent OSIM no.: R0133631- B1/29.11.2024

# Short presentation

The invention relates to an "S" cam braking mechanism having an actuating system (1) consisting of a body (8) supporting a shaft (10), and an axial movable assembly formed by the pusher shaft (14) and the spindle (15) with balls (16) sliding in the grooves (10c) and causing the cam (2) to rotate. Wear compensation and holding of the shoes (4) in the immediate vicinity of the drum (5) is made with a mechanical reaction loop formed by the sawtooth coupling (10a / 11a) and the threaded assembly (14c / 15c). Figure 1.

# Applicability

The camshaft brake mechanism S is app<mark>li</mark>cable to the wheel brake mechanism with drums and inner shoes.

# Images

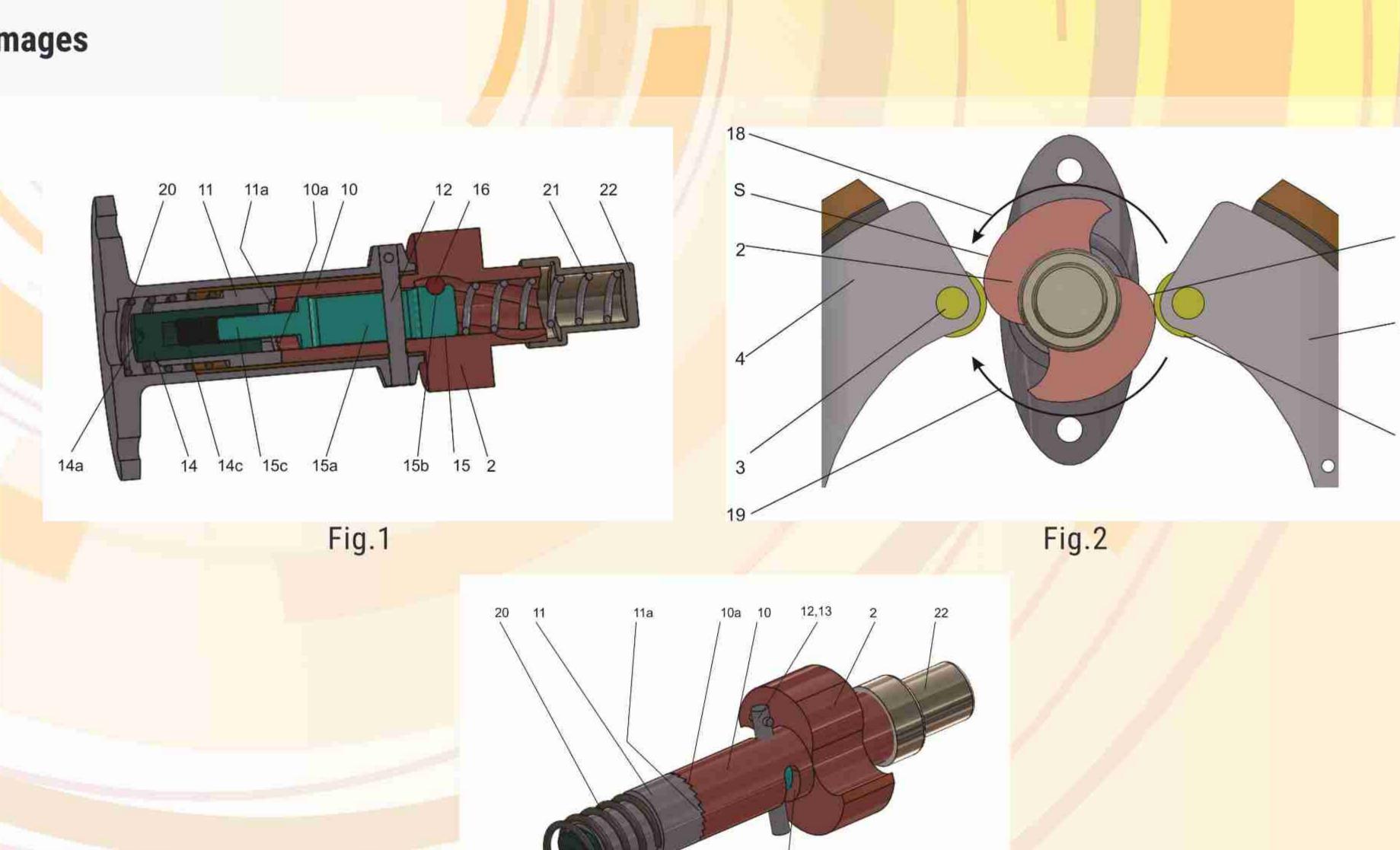


Fig.3



Department for Research, Development and Innovation Management Knowledge and Technological Transfer Center 15 Constantin Daicoviciu street 400020, Cluj-Napoca, România e-mail: liliana.pop@staff.utcluj.ro

Title
SOFA SIDE MADE BY THERMOFORMING PROCESS AND ITS ACCOMPLISHING PROCESS

Inventor/s - Contact
Ciupan Cornel, Filip Ioan, Cionca Ioan, Ciupan Emilia

Patent/ Application number

Patent OSIM no.: R0133392 -B1/29.03.2024

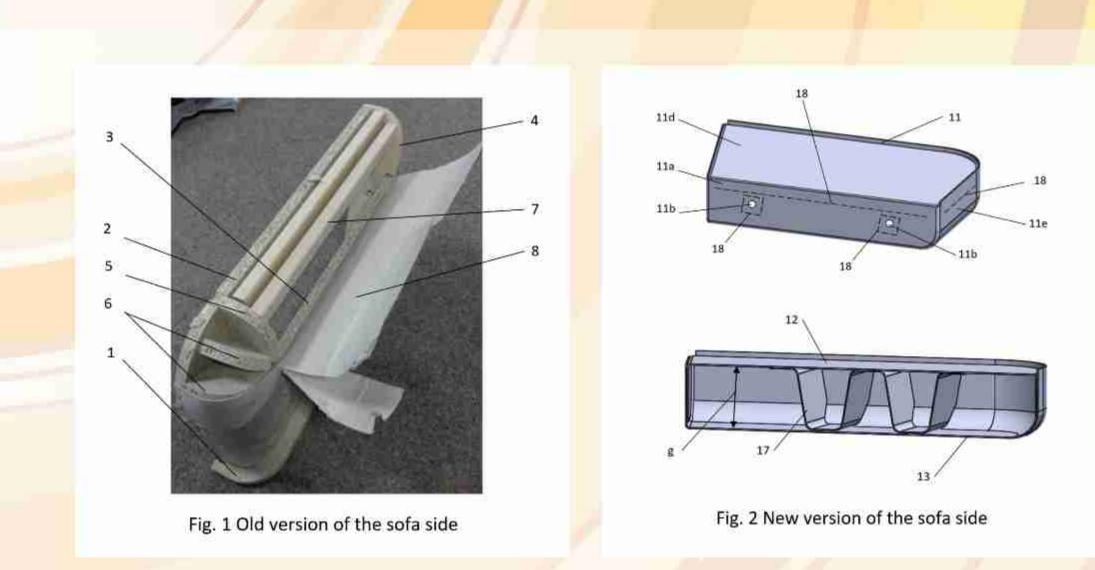
## Short presentation

The invention relates to the structure of a sofa side made of composite material based on natural fibers (hemp 50-60%) mixed with polypropylene (40-50%). The material is obtained by interweaving. The sofa side has the shape of a box and is made up of an inner shell, an outer shell and a rib that is mounted between the two shells. It replaces a classic side made mainly of wood which was made up of 21 pieces. The process presents the phases and parameters of thermoforming of the three components and the way of assembling them. The thermoforming process consists of the following phases: tailoring, heating to 210-220°C, transfer to the core mold and calibration by pressing with the cavity mold. After cooling, the piece is extracted from the mold and it is finished on the contour.

## Applicability

The invention was developed in collaboration with specialists from the Technical University of Cluj-Napoca and TAPOARO SA from Targu Lapus and is applied in the upholstered furniture industry. The main advantages: replacing wood with environmental protection effects, reducing the weight of the product, significantly reducing the number of parts and using a single material (composite), simplifying the manufacturing process and increasing productivity, resulting in a reliable product at a low cost.

## Images





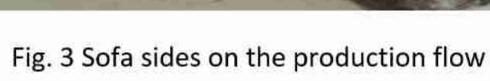




Fig. 4 Sofa sides – laboratory tests





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15 Constantin Daicoviciu street
400020, Cluj-Napoca, România
e-mail: liliana.pop@staff.utcluj.ro

www.utcluj.ro

# Title AXIAL ERROR COMPENSATION-BLADES FOR COMPRESSORS

# Inventor/s - Contact Ciupan Mihai, mihai.ciupan@gmail.com

# Patent/ Application number

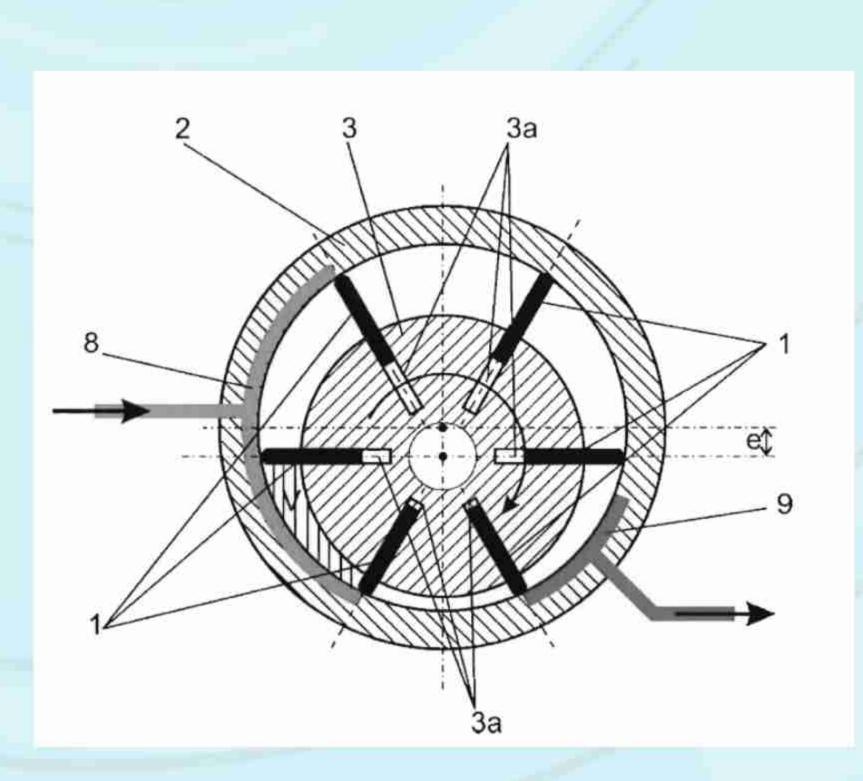
Patent application OSIM no.: R0138711A2

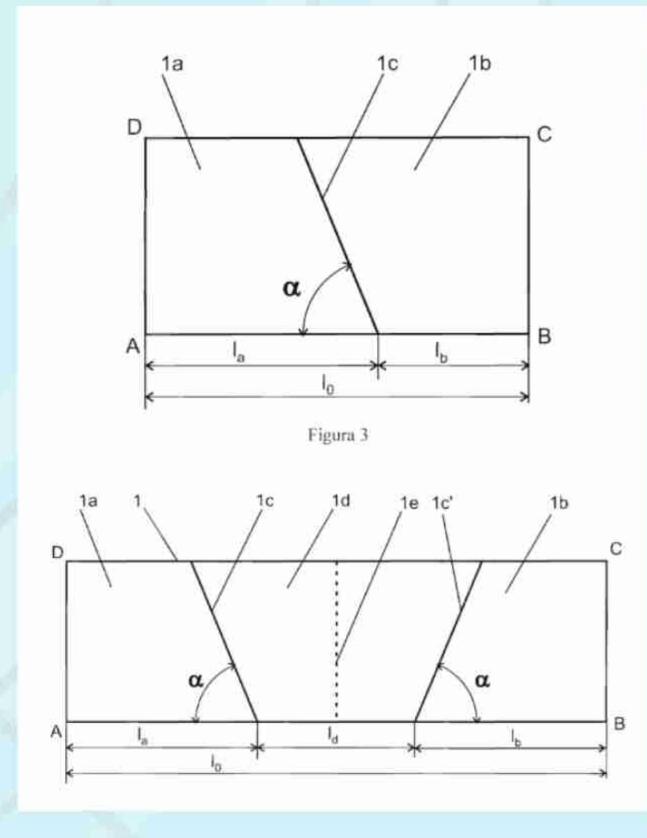
# Short presentation

The invention relates to blades meant to be used in making pneumatic bladed compressors or hydraulic bladed pumps. According to the invention, the blade has a rectangular shape ABCD, with a long side CD which seals a cylindrical case (2) of a compressor and two short sides AD and BC which seal lateral covers (5 and 6) and it is made by assembling at least two parts (1a and 1b) as a right-angled trapezium with the height in contact with the lateral covers (5 and 6), where, in operation, upon the action of the centrifugal force, the two component parts (1a and 1b) may slide in relation to each other on an inclined plane (1c) modifying the effective length (le) and compensating the axial errors.

# Applicability

Vane compressors for air and other gases







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#### Title

PROCEDURE AND INSTALLATION FOR TRIBOELECTROSTATIC SEPARATION OF NON-CONDUCTIVE **GRANULAR MATERIAL MIXTURES** 

#### Inventor/s - Contact

Călin Florentin-Laur, Bilici Mihai-Alexandru, Samuilă Adrian-Păun

### Patent/ Application number

Patent application OSIM no.: A/00035/06.02.2024

#### **Short presentation**

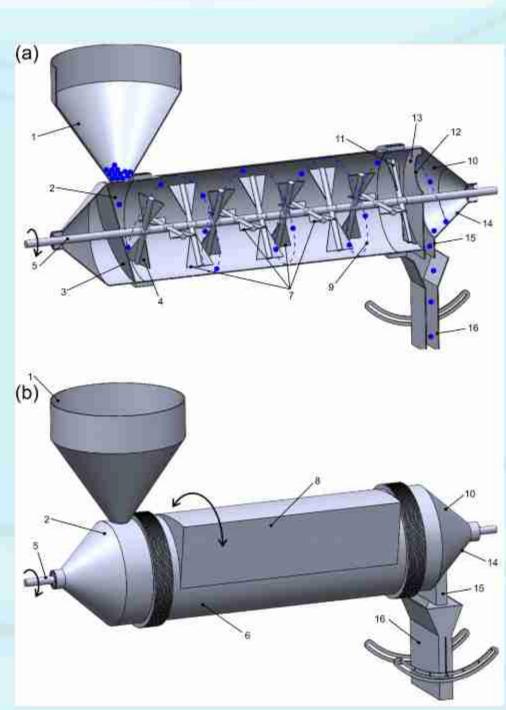
The invention relates to a process and an installation for the triboelectrostatic separation of the components of non-conductive mixtures of granular materials, such as: plastic waste, mineral substances, food products, etc. The triboelectrization process achieves high-efficiency charging with opposite polarity electric charges on the components A and B of a granular mixture. This is achieved through repeated collisions of controlled intensity between granules and between the granules and the walls of the specially shaped triboelectrization device. The electrostatic separation of the components of the mixture is accomplished by deflecting the granules that are charged with opposite polarity electric charges on distinct trajectories in an electrostatic field area.

The triboelectrization device has a feeding zone that facilitates the transfer of granular material into the triboelectrization zone, a specially shaped triboelectrization zone, and an evacuation zone that disposes the charged granular mixture in a monogranular layer towards the feeding device of the electrostatic separator. This device introduces the charged granular mixture into the electrostatic field area of the separator and promotes the deflection of granules (charged with electric charges of opposite polarity) on distinct trajectories and their collection of as separated fractions.

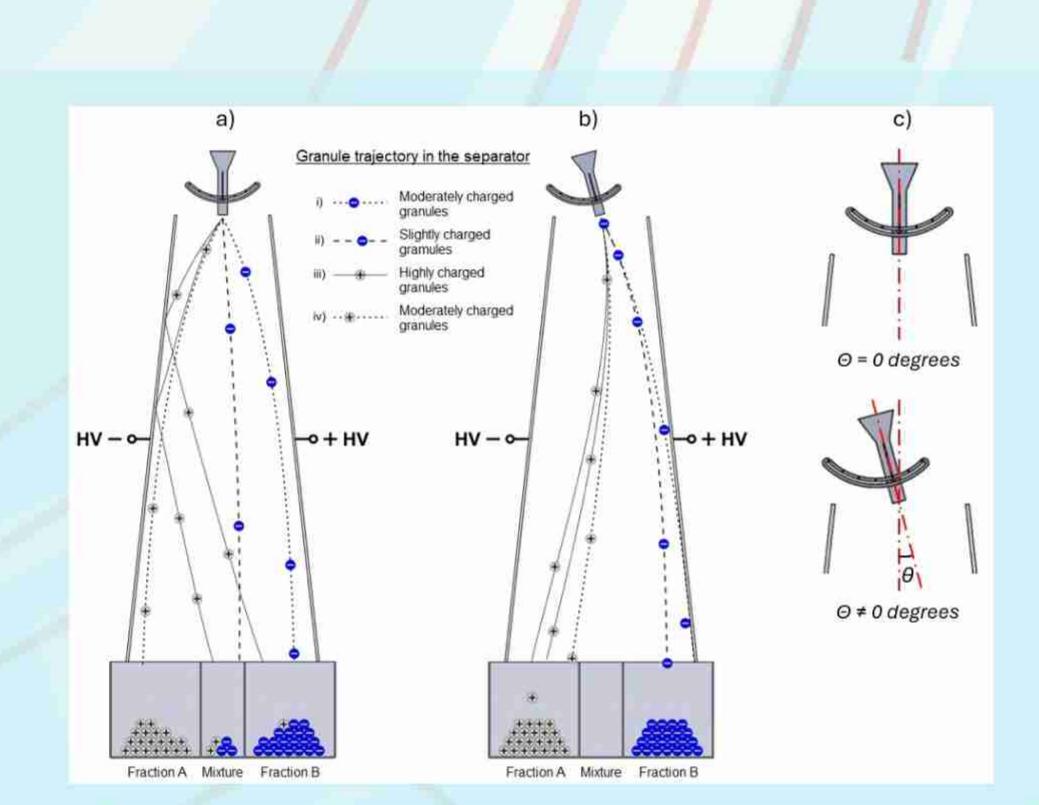
### **Applicability**

The invention will be applied in the field of plastic recycling to increase the purity and recovery of products obtained by triboelectrostatic separation.

## **Images**



3D isometric representation of the device for triboelectric charging of a mixture from non-conductive materials in crosssectional view (a) and overall view (b).



Control of the electrically charged granule trajectories in the electrostatic field through the edjustment of the entry angle into the separator  $\theta$  from a zero-degree angle (a) to a non-zero degree angle (b); detail on the entry angle adjustment (c).





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#### Title O

METHOD FOR MAKING CUSTOMIZED IMPLANTS FROM TITANIUM-GRAPHENE COMPOSITE WITH CONTROLLABLE MECHANICAL CHARACTERISTICS VIA SELECTIVE LASER MELTING PROCESS

# Inventor/s - Contact

Cosma Sorin Cosmin, Bâlc Nicolae Octavian, and Berce Petru

# Patent/ Application number

Patent application OSIM no.: A/00109/18.03.2024

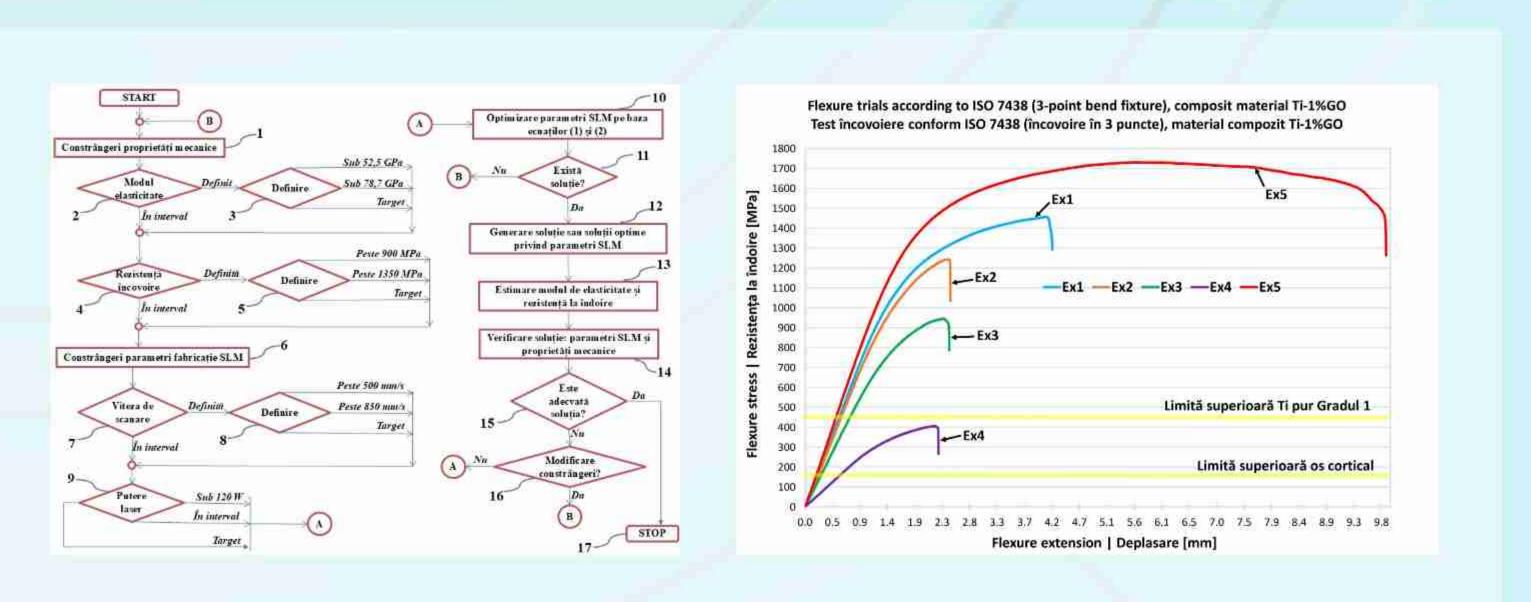
# **Short presentation**

The present invention relates to a direct method of obtaining personalized medical implants used for bone reconstruction made of composite material developed from pure titanium (Ti) and graphene oxide (GO) powder. The implants developed in this manner will have controllable mechanical characteristics, antibacterial and anticancer properties, and they will be fabricated using the selective laser melting (SLM) process. The technology allows modifying the elastic modulus and flexural strength of Ti-1%GO implants according to the patient's needs, following the logic diagram shown in Figure 1. This invention involves defining the mechanical characteristics and constraints of the SLM process parameters, and using the mathematical equations (1) and (2), they will generate the optimal solution for implant manufacturing. Thus, Ti-1%GO implants can be obtained with a specific elastic modulus, 25-50% lower than that obtained from pure Ti and/or an increased flexural strength (over 900 MPa). The method allows the estimation of the mechanical properties that can be obtained depending on SLM parameters and can improve productivity by generating an optimal solution, considering an increased laser scanning speed. The following advantages will be achieved: The elasticity modulus of implants made from this composite can be controlled and reduced, diminishing the stress shielding effect between the implant and host bone; The mechanical strength of implants can be improved (3 times higher than pure Ti) and the weight of them can be reduced via a design

optimization procedure, respecting also the medical requirements; The proposed method does not have a negative impact on the environment.

# **Applicability**

The method is intended for Additive Manufacturing (AM) technologies that use materials in the form of nanometric and micrometric powders and lasers for melting them together. This technology is feasible to produce implants with antibacterial properties by integrating graphene into the composite, which is uniformly distributed across the entire surface of the implant and within its structure, avoiding the typical delamination issue of coatings with graphene. The proposed invention did not have any limit regarding the implant shape complexity, and it can predict the influence of SLM parameters on the elasticity modulus and on the bending strength of implants made from Ti-GO.





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15 Constantin Daicoviciu street 400020, Cluj-Napoca, România

e-mail: liliana.pop@staff.utcluj.ro

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### Title

RHYHTM TOUCH - DEVICE FOR REAL-TIME MUSIC-TO-VIBRATION TRANSLATION

#### Inventor/s - Contact

Bara Iulia, Mihali Mărioara, Popa Ioana-Andreea, Rizel Maria-Cătălina

## Patent/ Application number

Project "RHYTHM TOUCH"

### Short presentation

We believe music can change the world — and we're bold enough to prove it. Rhythm Touch is a wearable device that transforms sound into real-time tactile vibrations, creating an inclusive and emotional music experience for all users. Initially inspired by the needs of hearing-impaired people, the device is loved by everyone who has tried it.

Rhythm Touch breaks the barrier between the hearing and the deaf communities and challenges the conventional belief that music is only for those who can hear. By analyzing key sound characteristics the device translates audio signals into tactile vibration patterns that can be felt in real time.

It brings a new dimension to music — not just through sound, but through sensation. This makes it ideal not only for festivals and concerts, but also for therapeutic settings, inclusive education, and personal use.

Combining signal processing with haptic technology, Rhythm Touch redefines music as a shared, emotional, and multisensory experience. It stands at the intersection of innovation, inclusivity, and human connection.

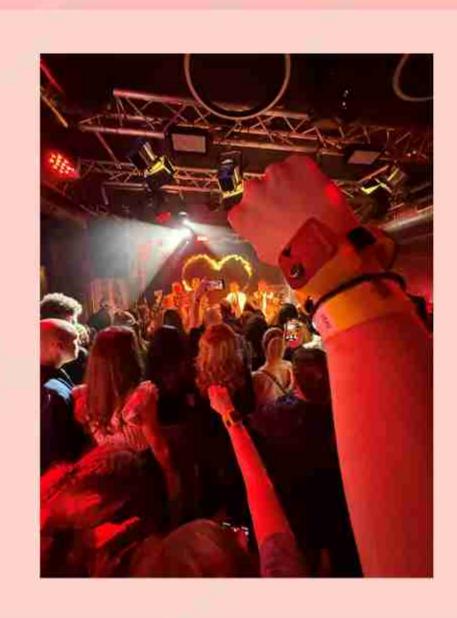
The project has been awarded multiple national and international prizes and supported by leading innovation incubators, standing as a symbol of how technology can empower social change.

### Applicability

Rhythm Touch can be used at live events (concerts, festivals), in educational settings (special schools), in therapeutic contexts (sensory integration therapy), and in personal use for music enjoyment. It promotes accessibility in the entertainment industry and offers people with hearing impairments the chance to feel music through vibrations. Beyond its assistive function, it enhances the music experience for all users by adding a tactile dimension, making it ideal for immersive experiences in events and media. The device also aligns with global trends toward inclusive design and sensory-based technologies.

#### Images







Institut National Polytechnique

Laboratory of Industrial Processes of Synthesis, Environment and New Energies (LAPISEN), National Polytechnic Institute Félix Houphouet-Boigny, Yamoussoukro BP 1093, Ivory Coast. https://www.inphb.edu.ci



Buildings and Management Department Faculty of Civil Engineering

25 Baritiu Street, 400027, Cluj-Napoca, Romania E-mail: ligia.moga@ccm.utcluj.ro www.utcluj.ro

# \* Title:

# OPTIMIZATION OF THE PHYSICAL AND MECHANICAL PROPERTIES OF ECO-FRIENDLY MORTAR CONTAINING ROMANIAN FLY ASH USING A FULL FACTORIAL DESIGN

❖ Authors: PhD stud. GARBA LABO Mahaman Nazirou, Prof. Ligia MOGA, Prof. YAO Kouassi Benjamin

labo.garba21@inphb.ci; +2250704051722 & ligia.moga@ccm.utcluj.ro; 0740 185 834

# ❖ Patent/Application number: Patent pending

# **❖** Short presentation

Cement-based materials are essential in construction but remain highly energy-intensive and carbon-intensive. To address this challenge, integrating industrial by-products such as Romanian fly ash into eco-friendly mortars offers a promising pathway. Beyond reducing CO<sub>2</sub> emissions and valorizing waste, the key lies in ensuring optimized physical and mechanical performance. By applying a full factorial design, this study systematically explores the interactions between factors, paving the way toward high-performance, sustainable mortars that serve both the construction industry and environmental goals.

For the fabrication, a full factorial design (2²) with duplicates was employed to evaluate the effect of cement substitution by Romanian fly ash on the flexural strength (Rf) and compressive strength (Rc) of the standard mortar (F0: standard formulation). The symbols (+) and (–) represent the high and low levels of the factors (cement and fly ash). Table 1 summarizes the different cement and fly ash percentages as well as the corresponding experimental responses.

The ANOVA analysis (Minitab 19) and Pareto charts indicate that: For Rf (fig1), all factors and their interactions are highly significant (p < 0.05) and for Rc (fig2), cement and fly ash have a significant positive effect (p < 0.05), while their interaction has a negative effect, leading to a reduction in strength.

The quality of the developed model was evaluated using the coefficients of determination R<sup>2</sup> and adjusted R<sup>2</sup> (table 2). High R<sup>2</sup> values for Rf (0.938) and Rc (0.999) indicate an excellent correlation between experimental and predicted results, explaining over 93% and 99% of the observed variability, well above the 0.80 threshold suggested by Briton et al. (2018).

The optimization plot (fig3) shows that the optimal mixture, with 95% cement and 5% ash V, achieves a high overall desirability (D = 0.9925) with Rc = 50.010 MPa and Rf = 7.6105 MPa. Increasing cement and reducing ash V simultaneously enhance both strengths.

Despite the slightly negative interaction effect between cement and Romanian fly ash (RFA) observed in the statistical analysis, the mortar containing 20% RFA and 80% cement exhibited significantly higher compressive (Rc) and flexural (Rf) strengths compared to the 100% cement control.

# Applicability: sustainable construction, construction materials, civil engineering.

# ❖ Images

Table 1: Hadamard matrix, experimental design, responses

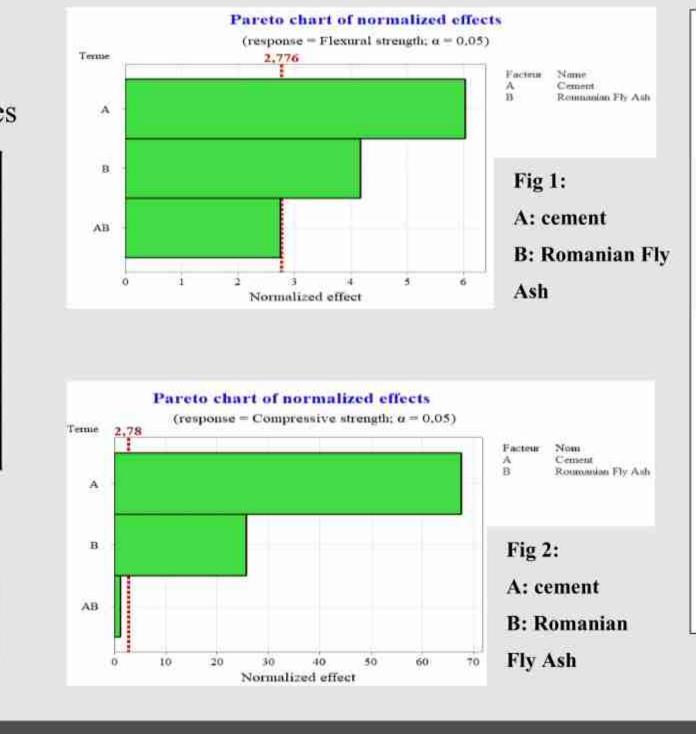
Essai	Cement	Fly Ash	Cement	Fly Ash	Rf	Rc
F0			450	225	6,00	40,82
F1		-	80	5	7,07	39,33
F2	+		95	20	7,58	49,97
F3		+	80	5	5,70	35,37
F4	+	+	95	20	7,02	45,79
F5	#	÷	80	5	6,750	38,83
F6	+		95	20	7,641	50,05
F7	-	+	80	5	5,156	35,01
F8	+	+	95	20	7,594	45,66

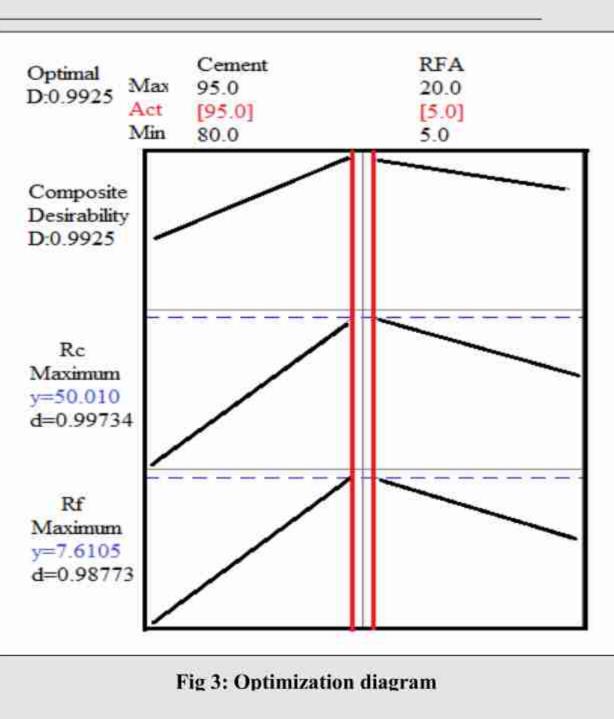
 Tableau 2 : Coefficient of determination

 Responses
 Rf
 Rf

 R²
 0.938
 0.999

 R²A
 0.893
 0.998







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Title
MONO-BLOCK BODY FOR LOW-MASS VEHICLES

Inventor/s - Contact
Bere Petru Paul; Neamţu Călin Gheorghe Dan; Dudescu Cristian; Krolczyk Grzegorz; paul.bere@tcm.utcluj.ro

Patent/ Application number

Patent OSIM no.: R0133971- B1/30.12.2024

## Short presentation

The invention relates to a monoblock body for motor vehicles and to a sandwich-type fiber-reinforced composite material for making the body, the composite structure exhibiting high mechanical resistance and low mass. According to the invention, the body is made of a sandwich-type composite structure consisting of a honeycomb-like aluminium core (10) placed between an exterior layer (9) and an interior layer (11) made of a glass-fiber-, carbon-fiber- or Kevlar-reinforced composite material, the body consisting of two cones (1 and 2), a front one and a back one, for impact, continued with a floor (3) provided, on the edges, with two sills (4) made of composite material, onto which four pillars (5) supporting the ceiling (6), are connected, on the edge they having a resistance structure (19), with a reinforcing element (7) placed inside the door with the role of protecting the passengers in case of lateral impact, all the mentioned elements being obtained in a mould with multiple separation planes inter-connected during the process of composite lamination, the operation being performed simultaneously, to finally result in a complete monoblock body.

Applicability

The patent applies to a body in white composite structure for automotive industry

