



A GREATER FUTURE TODAY

cidetec➤

MEMBER OF BASQUE RESEARCH
& TECHNOLOGY ALLIANCE

Nueva generación de materiales y
superficies para el sector ferroviario

in-move
by Railgrup

AIAS
ASOCIACIÓN
DE INDUSTRIAS
DE ACABADOS
DE SUPERFICIES



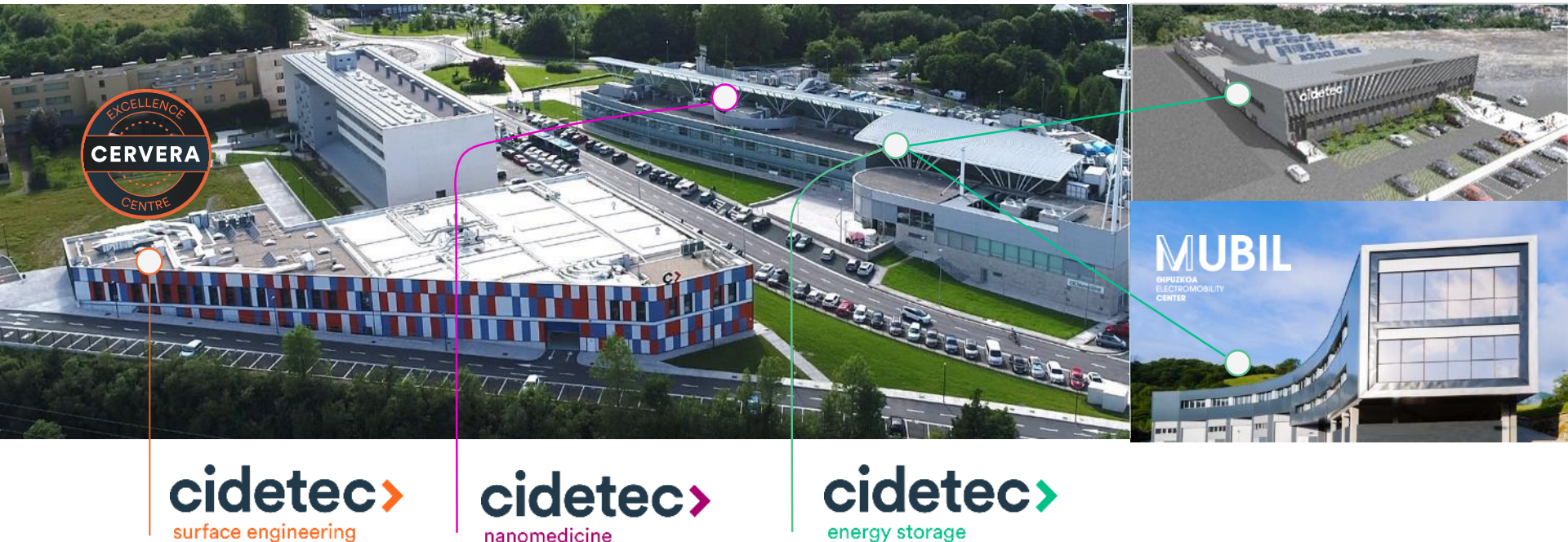
CIDETEC is located in the Basque Country, one of the regions with the highest rates of progress and well-being in Europe and characterized by a solid industrial tradition that currently represents a quarter of its productive endeavour. It also counts on a self-government system that allows it to establish its own economic and fiscal policies.

The right place to be





A great technological complex





Key data

21 M€

Turnover in 2023

>250

People

15 M€

Invested (2018-2022)

20 M€ +

(2023-2024)

20

Thesis in progress

32

Patent families

82

European participated projects
(22 as coordinator)

214

ISI publications over the last 5 years

8

Spin-offs

A microscopic view of a textured surface, possibly a material used in engineering, showing circular features and a woven pattern. The image is split diagonally: the top-left is orange, the bottom-left is dark blue with a textured pattern, and the right side is white.

**Smarter
surfaces
that make a
difference**

cidetec >
surface engineering

Nueva generación de materiales y
superficies para el sector ferroviario



A big player in Surface Engineering

CIDETEC es uno de los principales centros tecnológicos europeos especializados en el tratamiento y acabado de superficies, englobando una amplia oferta tecnológica.

150+

Cientes
en 2022

H2020



24

(10 de ellos
coordinados)

HEU



5

(1 de ellos
coordinado)

8



**FAMILIAS de
PATENTES**

STAFF

Investigadores y
Técnicos



80

3



Spin-offs: INNOMAT,
KERA-COAT, TUBA-COAT

6



**PhD tesis en
marcha**



CIDETEC

Surface Engineering

CIDETEC is one of the major European technological centres specialised in surface processing and finishing

R&D Focus Areas



STAFF

90

Researchers
& Technicians



11

PATENT
FAMILIES

+ 150

CUSTOMERS



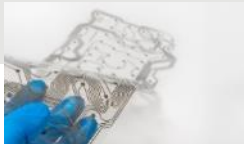
Sustainable composites

- H2 tanks by Filament Winding
- Fast curing recyclable epoxy resin for C-RTM (BiW, chassis or battery box)
- Composite thermoforming
- Printed electronic integration in recyclable composite



Smart and functional surfaces

- Metallic surfaces with transparency to ADAS systems (radar, cameras, or LIDAR)
- Self-healing materials and surfaces
- Self/easy-cleaning surfaces
- Anti-icing surfaces
- Anti-fog surfaces
- Anti-insect surfaces
- Reduced drag



Printed electronics

- Back-illuminated surfaces for decoration
- In-mold electronics
- Capacitive, resistive and sliding sensors
- Antennas; RFID, NFC
- Heaters (transparent)
- Haptic feedback



Protective and barrier coatings

- Protective coatings: Metallic, organic and ceramic
- Effective barriers towards corrosion, wear and hydrogen



REACH compliance solutions

- Trivalent chromium plating
- Cr-free etching, conversion coatings, primers and anodizing
- Electroless nickel
- Sol-gel
- Anaphoretic e-coating
- Metal matrix composite coatings
- n-Ni plating



Advanced paints

- Self-healing PU coatings
- Durability
- Functional paints
- Paint modification
- Water based
- VoC reduction

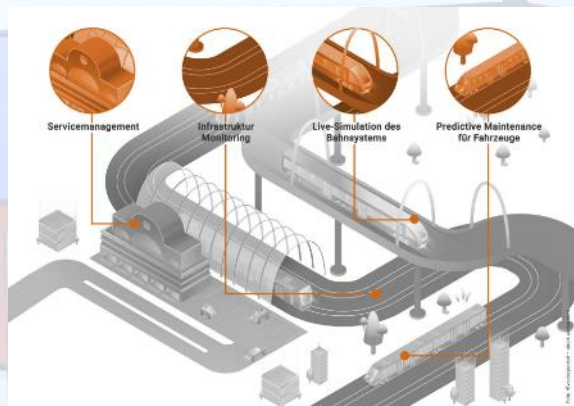


Hydrogen

- Hydrogen embrittlement in piping and vessels: metallic and ceramic coatings
- Early detection and characterisation of fragilization
- Recyclable Composites for high pressure hydrogen storage tanks (high pressure and cryogenic by filament winding)



Next in Advanced Materials



From Decorative to Functional

Materials

Batteries

Coatings

Electronics



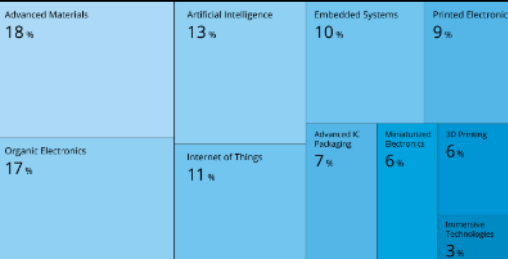


Printed Electronics Market

The printed electronics landscape has seen substantial growth in recent years and there's no sign of it slowing down. In 2023, the global printed electronics market size by material and substrate reached 13.1 billion USD. The healthcare/wellness and automotive sectors dominated the market, fueled by various applications ranging from in-mold touch sensing to wearable glucose test strips.

As 2024 kicks off, the forecast for the printed electronics market is showing promising growth — supporting well established sectors like conductive inks while also shining light on emerging use cases like in-mold electronics. These trends serve as an indicator of how closely the next generation of electronics will integrate with our daily lives.

Impact of Top 10 Electronics Manufacturing Trends & Innovations in 2024



This treemap illustrates the top 10 innovation trends & their impact on the Electronics Manufacturing. StartUs AI, Inc. Copyright © 2023 StartUs Insights. All rights reserved. August 2023.

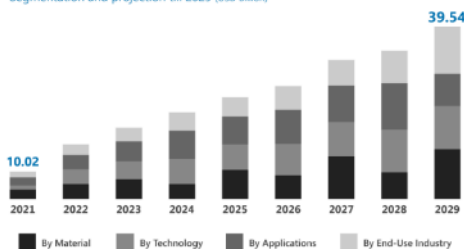
Individually, the market for printed electronics is projected to grow at a compound annual growth rate (CAGR) of approximately **19% between 2024 and 2033**. By the end of 2024, the market is projected to reach a total value of over 15 billion USD.

CAGR

2022-2029
19.1%

Global Printed Electronics Market

Segmentation and projection till 2029 (USD Billion)

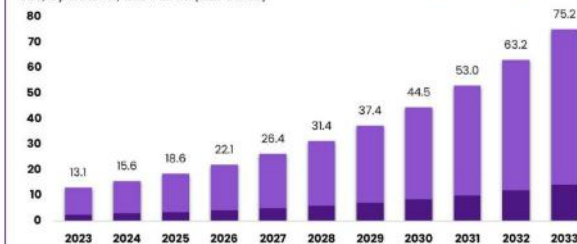


source: greyviews.com

Source: [GreyViews](https://greyviews.com)

Global Printed Electronics Market

Size, by Material, 2024-2033 (USD Billion)



The Market will Grow At the CAGR of:

19.1%

The Forecasted Market Size for 2033 in USD:

\$75.2B

market.us

Source: [Market.us](https://market.us)



Printed Electronics Market Drivers

Conductive inks: Being the most critical component of printed electronics applications, continued investment in conductive inks will enable cost-effective production of lightweight and flexible electronics.

Substrates: Equally as important as conductive inks, the rise in lightweight, flexible, and stretchable applications will also result in increased demand for materials to print on: thermoplastics & Composites

RFID technology: As retail tracking and data communication continues to expand, RFID technology will grow in tandem, particularly with regards to opportunities in smart packaging.

The Internet of things (IoT): [Forbes](#) projected that by the end of 2024, over 200 billion IoT devices, ranging from toys to appliances, will be connected online. With the form factors of electronics rapidly evolving, it's expected that IoT devices will help drive global adoption of printed electronics.

Flexible and stretchable electronics

Displays: With applications in consumer electronics and automotive dashboards, displays hold the highest market share at [over 38%](#).

Sensors: Innovations in healthcare, batteries, environmental monitoring, industrial automation, and wearables can be attributed to the continued growth of sensors.

Photovoltaics (PV): Within the energy sector, flexible PVs are predicted to gain large traction primarily driven by integration with buildings.

Flexible Batteries

Printed Electronics Smart Surfaces



Product advantages for new functions & spaces:

- Custom Cockpit
- Connectivity (Adv. Antennas, ...)
- Comfort in interiors (Lighting, displays, seats-heaters, health monitoring ...
Smart Toilets, privacy pods, dinner car, family area, fitness studio, ...)
- Weight distribution monitoring (safety & energy opt.)
- Modern signals
- Safety Apps.
- MRO
- ...





Our Developments

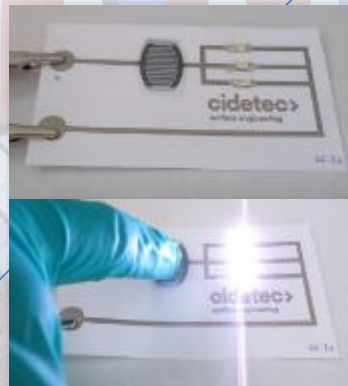
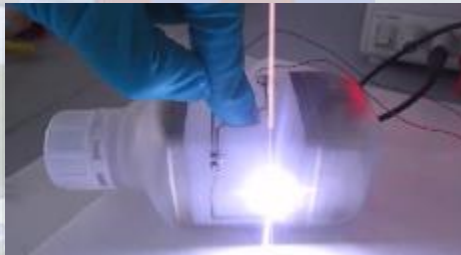
- ✓ Modified sustainable inks with improved properties and/or performance
- ✓ Organic conductive inks (metal-free) with improved stability through the incorporation of biobased nanoadditives
- ✓ Transparent conductive inks with low metal content

Functional & sustainable products



Our Developments

- ✓ Selective deposition of functional inks in 2D and 3D surfaces
- ✓ Deposition of metallic circuits with high conductivity in 2D and 3D surfaces
- ✓ Capacitive sensors
- ✓ Haptic sensors for user interactive (UX)



Smart control touch

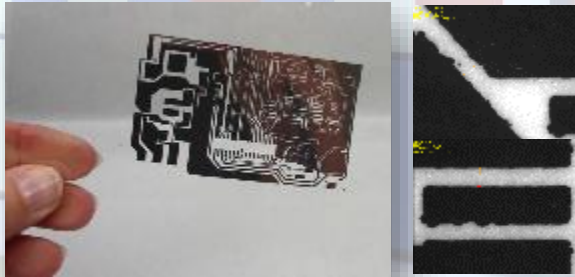
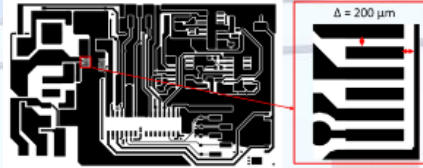




Our Developments

- ✓ High resolution printed circuits (PCBs) on rigid or flexible 2D surfaces

Flexible PCBs for railway applications



- Process simplification
- Reduction of manufacturing times
- Weight reduction
- Material savings (additive process)



Braking systems

PCBs for all different parts of the braking systems: monitoring communication, temperature and brake pad wear warning system. Demands are DIN EN 50155/IEC 60751 and controlled smoke development/material choice in case of fire. Crucial factors are high reliability, size constraints, redundancy and harsh conditions.

PCB Technology



Climate control

PCBs for controlling air purification in high speed trains. Demands are TB/T 3139-2021, SN30412-1 (002).

PCB Technology



IoT systems

PCBs for monitoring high speed railway track vibration and meteorological data. Demands are TB/T 3139-2021, SN30412-1 (002). Crucial factors are high reliability and harsh conditions.

PCB Technology



On board datacom system

PCBs for controlling different functions, like hydraulics, on board high speed trains. Demands are TB/T 3139-2021, SN30412-1 (002). Crucial factor is high reliability.

PCB Technology



Pantograph systems

PCBs for high voltage power conversion, high voltage power stages and control units. Demands are DIN EN 50155/IEC 60751. Crucial factors are high reliability and harsh conditions.

PCB Technology



Propulsion

PCBs for motor control/drive electronics, high voltage power stages and control units. Demands are DIN EN 50155/IEC 60751 and controlled smoke development/material choice in case of fire.

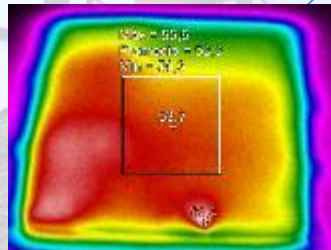
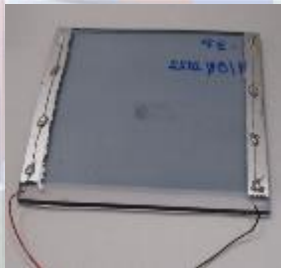
PCB Technology



Our Developments

- ✓ Heaters on different materials (PET, PC, PEEK, Kapton, etc.)
- ✓ Metallic tracks with high resolution on 2D surfaces
- ✓ Transparent conductive heaters on 2D and 3D surfaces

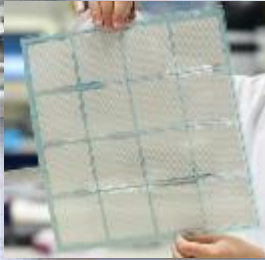
Heaters (radar and optical transparent)





Our Developments

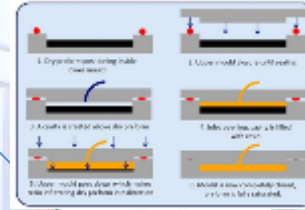
Printed electronics in Composite



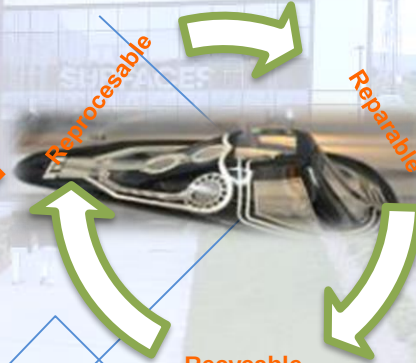
Printed electronics



Hybridisation of electronic components



C-RTM & Thermoforming



Printed electronics in Composite

CONTRIBUTING TO:



High performance



Competitiveness



Re-processability



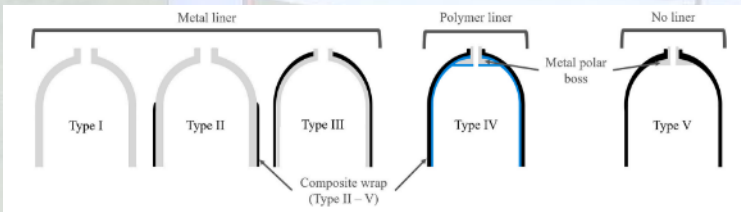
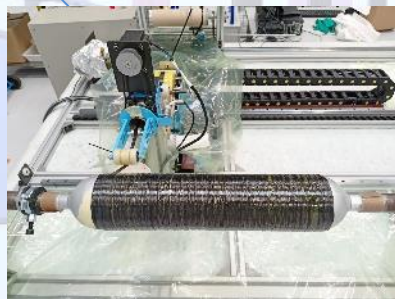
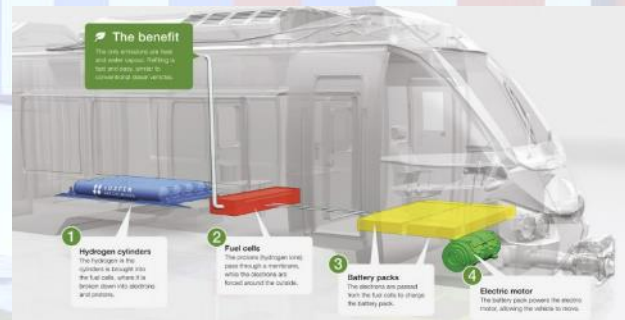
Reparability



Recyclability

Sustainable Composites

H₂ Tanks Monitoring



FW and/or AFP



> In-mold electronics pilot plant

We cover the whole
value chain



Ink modification



Printing



Pick & Place



Thermoforming



**Overmoulding
thermoplastics & composites**

Ink formulation

Printing: Automatic Screen printing THIEME LAB 1000 (600)

Hybridisation: Pick & Place ESSEMTEC PUMA 1

Thermoforming: NIEBLING SAMK 720 (TP & Composites)

Injection: ARBURG ALLROUNDER 470S & C-RTM





Conclusions

From Decorative to Functional:

- ✓ Relevant role of **train manufacturers** as value chain prescriptors and during validation.
- ✓ **Printed Electronics** is a versatile **technology** allowing the integration of **advanced** materials for **new functionalities**.
- ✓ **Sustainability is a MUST**: new substrates, cutting-edge inks, processes, etc.
- ✓ **Digital Tools** should help **technical challenges** like: scrap reduction by design, use of more ecofriendly materials, defective reduction, repeatability and reliability & **new applications**.
- ✓ **Be creative regarding new applications considering Rail Industry Requirements & Standards.**

The railway industry should embrace the potential of cutting-edge advance materials...



Egoitz Luis

BUSINESS DEVELOPMENT
MANAGER

Gracias!

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