INJELEC

CONECTUS

OFFICIAL INNOVATION PROVIDER

INJELEC

Our new technology proposes a different PEDOT synthesis on specific particles to create **electrically conductive polymer fillers.**

Our novel synthesis uses **conductive polymers, like PEDOT**, which are very good candidates in the field of **printed electronics and avoids the classic solvent-based processing of these materials.**

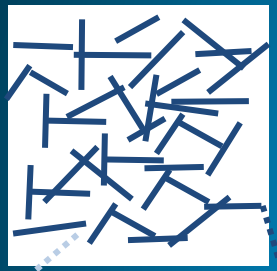
- **Electro conductive filler**
- **Easily processable with injection & 3D printing**
- **Usable in thermoplastic matrices**
- **Competitive with carbon based conductive polymer** up to 80S/cm
- **Lightweight properties**
- **Lower material costs**

- **TRL 3 > 4**
- **MATURATION PROGRAM > 2026**
- **INDUSTRIAL DEMONSTRATOR > S1 2026**

POC

- **CONDUCTIVE PARTS**
- **INJECTED/EXTRUDED THERMOPLASTICS**
- **3D PRINTING**
- **PRINTED ELECTRONICS CIRCUITS**
- **BIPOLAR PLATES FOR FUEL CELLS**

HOW TO OBTAIN AN ELECTRICALLY CONDUCTIVE THERMOPLASTIC MATERIAL ?



Thermoplastic matrix

Conductive filler

Cost

Very high filler rate

Need to handle nanoscale fillers

Processing difficulties

2 MAIN STRATEGIES

Conductive Thermoplastic Materials

Conductive Thermoplastic Composites

Intrinsically Conductive Polymers

Examples :

- Polyacetylene (PA)
- Polyaniline (PANI)
- Polypyrrole (PPy)
- Polythiophene (PTH)
- Poly(para-phenylene) (PPP)
- Poly(-phenylenevinylene) (PPV)
- Polyfurane (PF)

Infusibility

Insolubility in various solvents

Unstable in air

NEW STRATEGY ?

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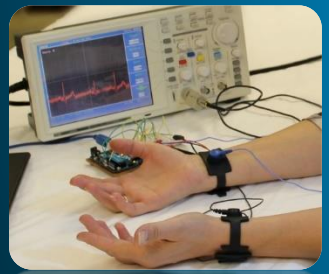
CAN WE MADE CONDUCTIVE THERMOPLASTIC COMPOSITES BY USING PEDOT BASED FILLERS IN EXTRUSION PROCESS ?

WHAT RANGE OF CONDUCTIVITIES ARE WE TALKING ABOUT ?

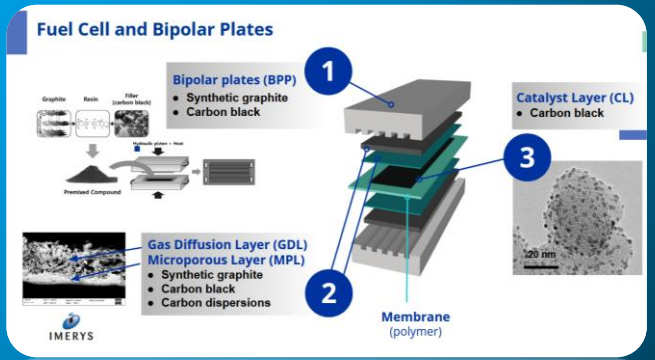
ENERGY STORAGE & BATTERIES
close to 100 S.cm^{-1}

0,1 — 1 — 10 — 100 — S.cm^{-1}

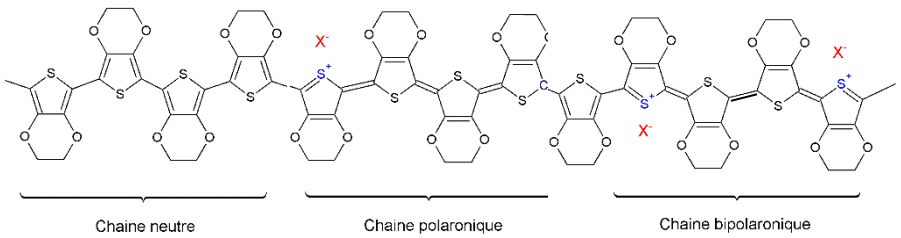


Conductive filament Protopasta® PLA filled with graphene

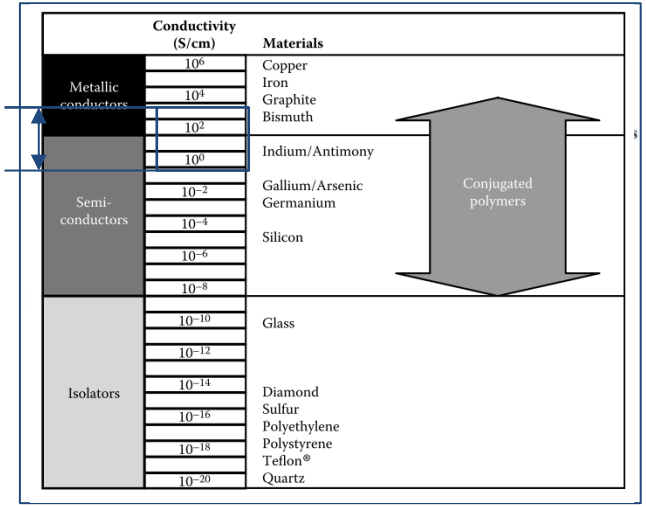
PLASTRONIC APPLICATIONS
1 S.cm^{-1}

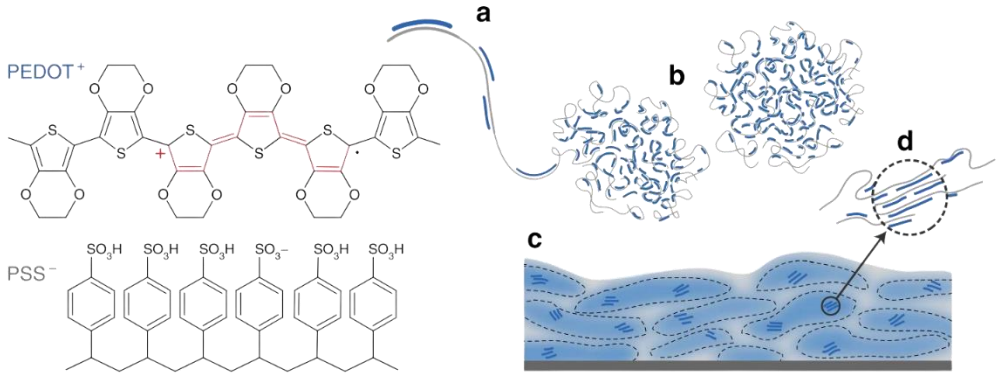


POLY(3,4-ETHYLENEDIOXITHIOPHENE) or PEDOT



PEDOT



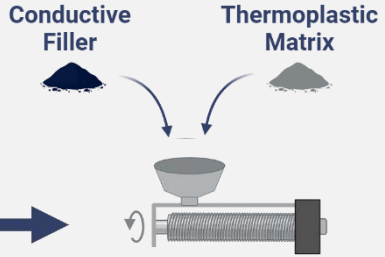


K. Namsheer and al, (2021), *RSC Adv*.
J. Rivnay and al, (2016) *Nature Communications.*

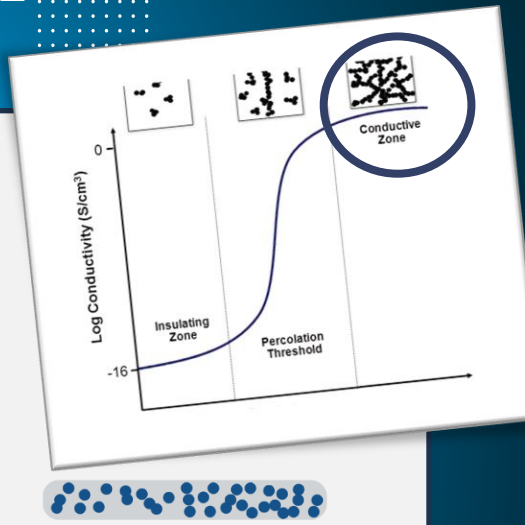
STRATEGY USED TO OBTAIN AN ELECTRICALLY CONDUCTIVE THERMOPLASTIC MATERIAL

Polymerization

Characterization of the conductive filler



Processing by extrusion



Characterization of the composite

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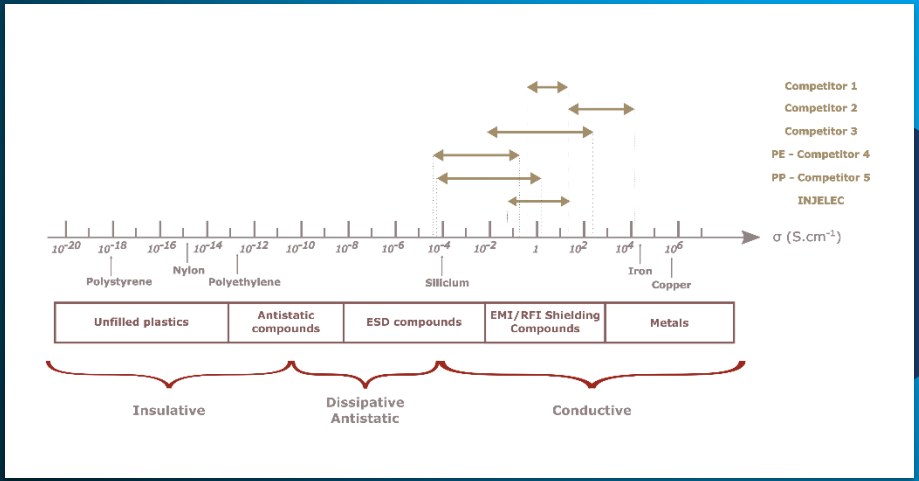
PROOF OF CONCEPT

Electroconductive thermoplastic composite

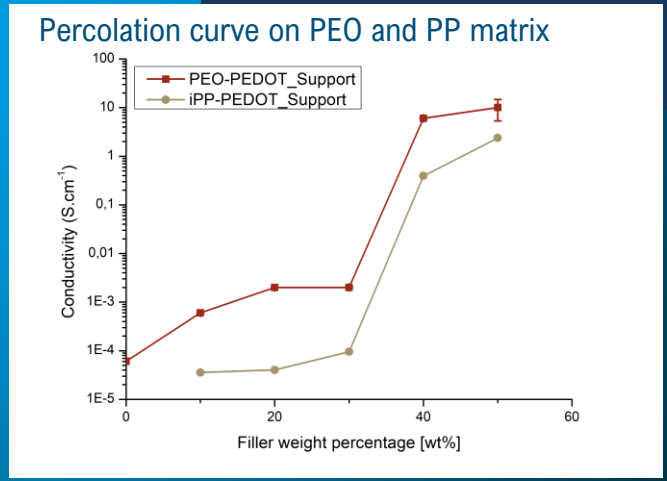
- Processing by melt extrusion of an electroconductive thermoplastic composites using an intrinsically conductive polymer as filler
- Compared to carbon materials similar conductivities could be obtained with 2 times less filler.
- The expected benefits are better cost / performance and better processability

INJELEC is competitive with other conductive thermoplastic composites commercially available using carbon or metallic based fillers



Maximal conductivities

INJELEC filler 50 $S.cm^{-1}$
12 $S.cm^{-1}$ in PEO / PP to be retested



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ONGOING PROGRAM

Development of an electrically conductive thermoplastic composite

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CONDUCTIVE PARTICLES SYNTHESIS

INCREASING THE CONDUCTIVITY

Optimization of the synthesis parameters

Target

conductive PEDOT particles conductivity higher than 100 S.cm^{-1}

Maximal conductivity :
PEDOT up to 180 S/cm
INJELEC 50 S/cm

CONDUCTIVE THERMOPLASTIC COMPOSITE

MATRIX CHANGING

Modification of the thermoplastic matrix from PEO to PP

Extrusion of PP composites filled until 50% of filler

PROCESSING OF THE CONDUCTIVE COMPOSITE

PROOF OF CONCEPT

Realization of a demonstrator using the INJELEC technology

On going

RESEARCH TEAM

THIBAULT PARPAITE

Assistant Professor

ADELE KARST

Mature Your PhD Laureate

IP² team is dedicated to applicative polymer research with numerous academic & industrial collaborations

Hello !

SATT

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OFFICIAL INNOVATION PROVIDER

TECH TRANSFER ACCELERATION COMPANY

www.conectus.fr

What we are LOOKING FOR

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MATURATION
ON GOING

Joint development to develop fully INJELEC filler

Validate a P.O.C of INJELEC a relevant case

Market insights & Technical insights

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FOURNISSEUR OFFICIEL D'INNOVATIONS

TECHNOLOGY TRANSFERS

SOLUTION PROVIDER

1

DETECTING
INNOVATIONS AT THE HEART OF PUBLIC LABS

#ALSACE

2

ASSESSING
THE ECONOMIC & SOCIETAL

#GROWTH NICHES

3

SECURING
INTELLECTUAL PROPERTY

KNOW-HOW PATENT & SW

4

FINANCING
SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT

DE-RISKING

Co-maturation

5

CO-DEVELOP
TECHNOLOGY + MOVE UP THE TRL LADDER
 # OUT-LICENSING
 # START-UP

Co-maturation

Focus

CO-CONCEPTION

OUR REQUIREMENTS

Technical orientation & business insights

Field of experimentation - POC - Pilot project

No joint ownership of the results generated

The industrial must not be the originator of an inventive contribution.

The lab remains the owner.

Financial contribution (deductible)

20% of the total investment provided by the manufacturer involved

Measuring the industrial effort and techno challenges

De-risking the technology, move up the TRL and target the growth niche(s)

Common vector # LICENSING

Transfering the technology at the end of the 18-month co-maturation program

OPEN INNOVATION

OUR SUCCES OPPORTUNITIES

Exclusive option on technology in the defined field/applications & territories

Intellectual property & investment supported by Conectus, under the strategic impetus of the industrials

Development of technology adapted to specifications #POC

First right of review of an exclusive licence

CONECTUS

Let's **connect!**

Don't hesitate to contact us

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