AIMPLAS
INSTITUTO TECNOLÓGICO
DEL PLÁSTICO

UNPRECEDENTED | WEBINAR SERIES 08 DE JULIO 12:00 h
Soluciones que aportan los Materiales Compuestos

CALEFACCIÓN EFICIENTE EN VEHÍCULOS ELÉCTRICOS

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Challenge

The Guardian

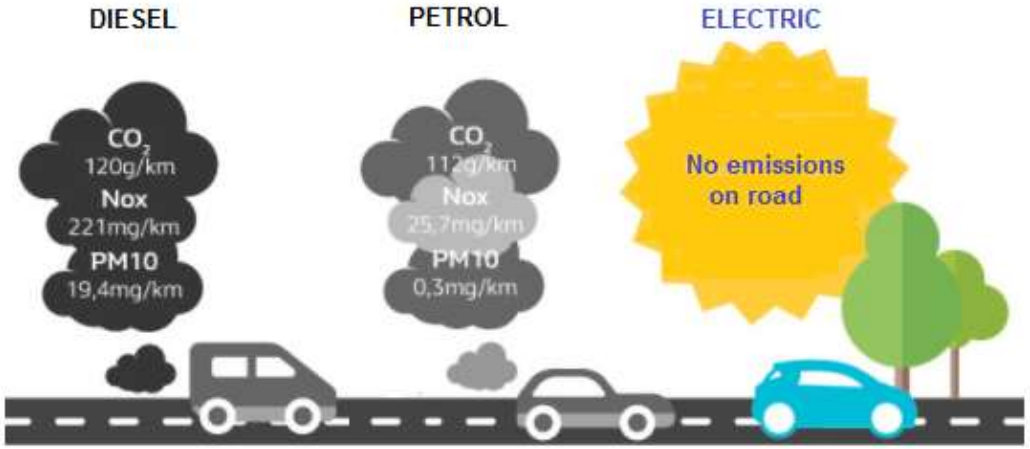
International edition

Paris mayor unveils plan to restrict traffic and pedestrianise city centre

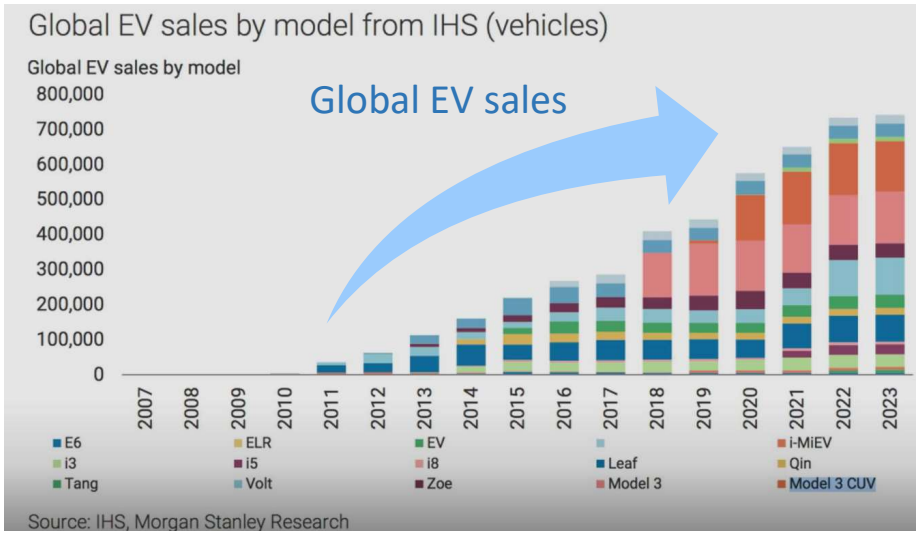
Anne Hidalgo says she wants to cut the number of private cars in French capital by half as part of campaign to tackle pollution


CO_2
CO_2


RENEWABLE
ENERGY


DIESEL
PETROL
ELECTRIC
CO_2
120g/km
Nox
221mg/km
PM10
19,4mg/km
CO_2
112g/km
Nox
25,7mg/km
PM10
0,3mg/km
No emissions
on road

Challenge



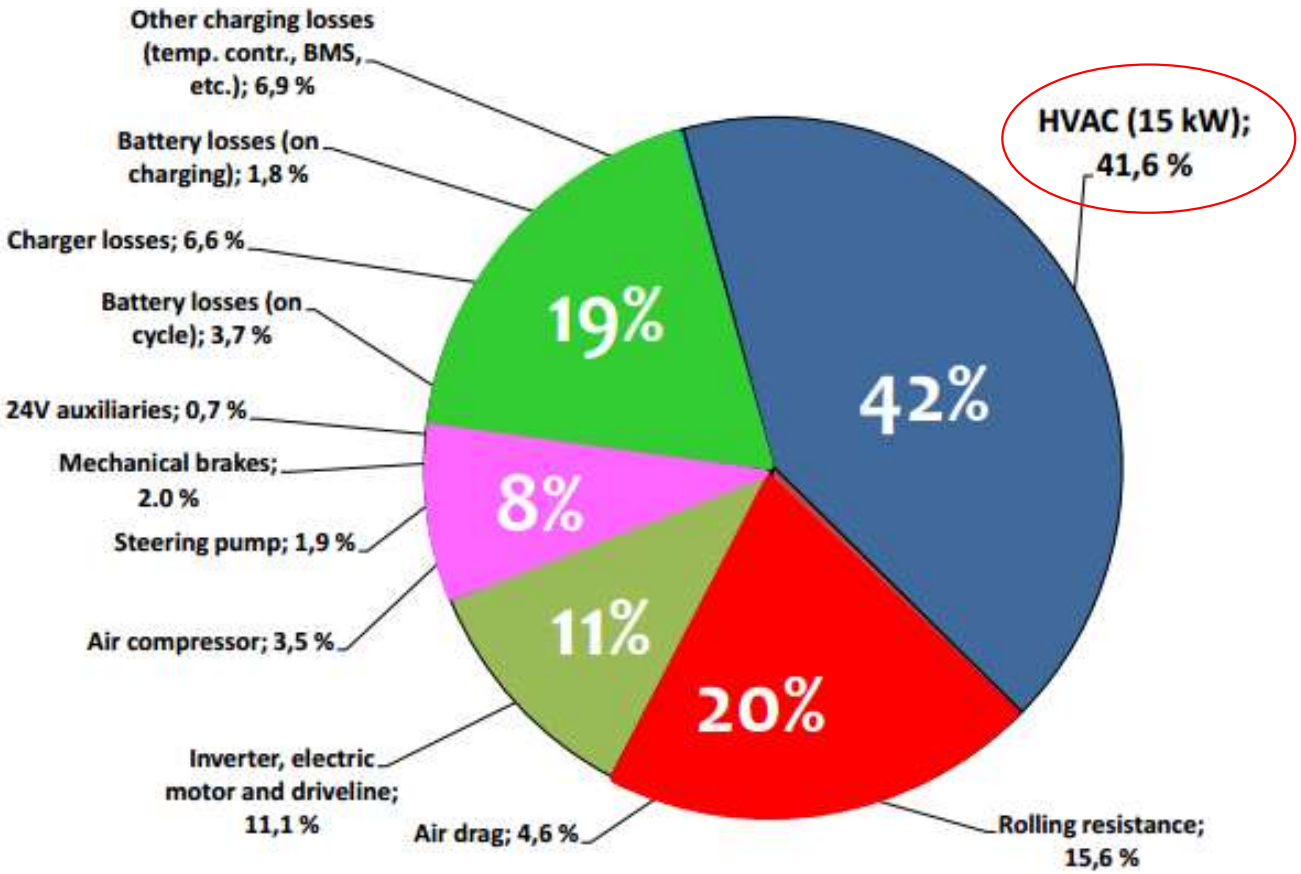
- ✓ Lower Price
- ✓ Improve charging systems
- ✓ Increase distance range

Challenge

Ways of **increasing distance range** of an electric vehicle:

- Increase engine efficiency
- Reduce car weight
- Improve battery efficiency
- Improve energy consumption
- Efficient Design

Challenge



Battery consumption

Innovative heating system

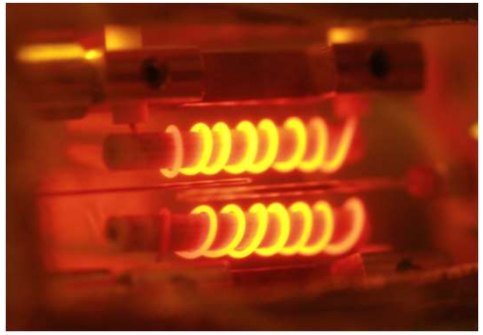
30% reduction

Resistive Heating as a possible solution

Concept

* Develop a plastics capable of behaving like a semiconductor or a metal

* The conductive polymer heats when an electric current in applied



Objective:

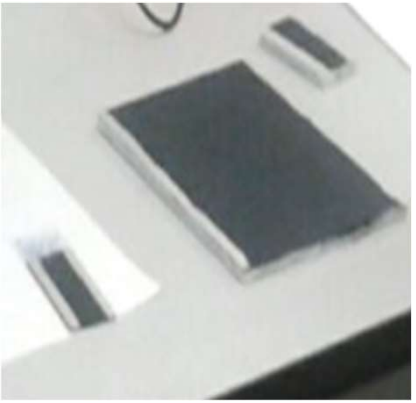
- making the plastic conductive by adding **conductive particles**
- improve **dispersion** on conductive particles to obtain high conductivity and an **homogeneous heating**

Concept

Two systems are developed:

1) **Resistive heating panels**:
- Recyclable
- Fast and cheap production process

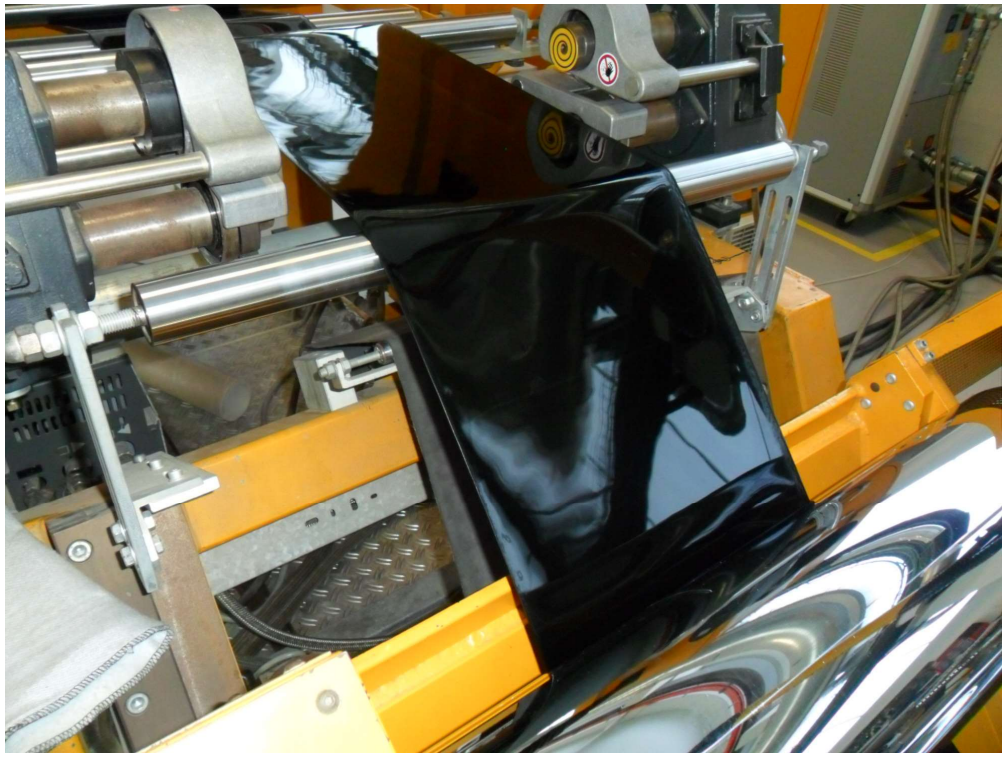
2) **Resistive coatings**:
- Flexibility
- Higher heating capacity



Patente española núm. 201830593, Panel calefactable y procedimiento de fabricación del mismo

Thermoplastic conductive panels

- Uniform heating
- Upper service temperature of 70ºC
- Customizable heating performance varying plastic formulation, panel geometry and applied voltage

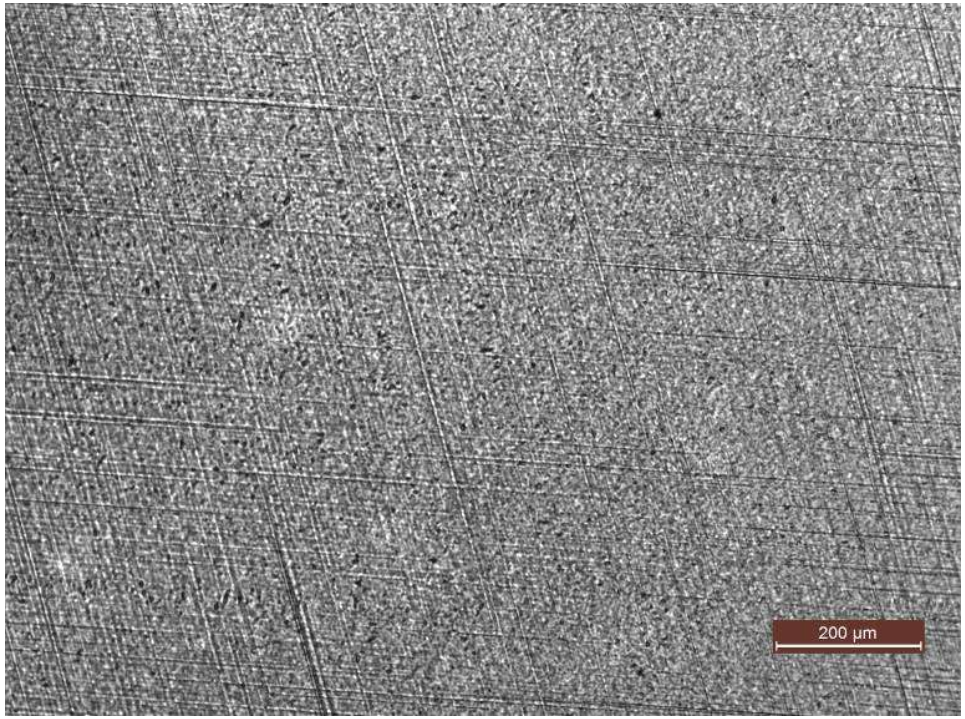


High electrical conductivity extruded sheet

Thermoplastic conductive panels

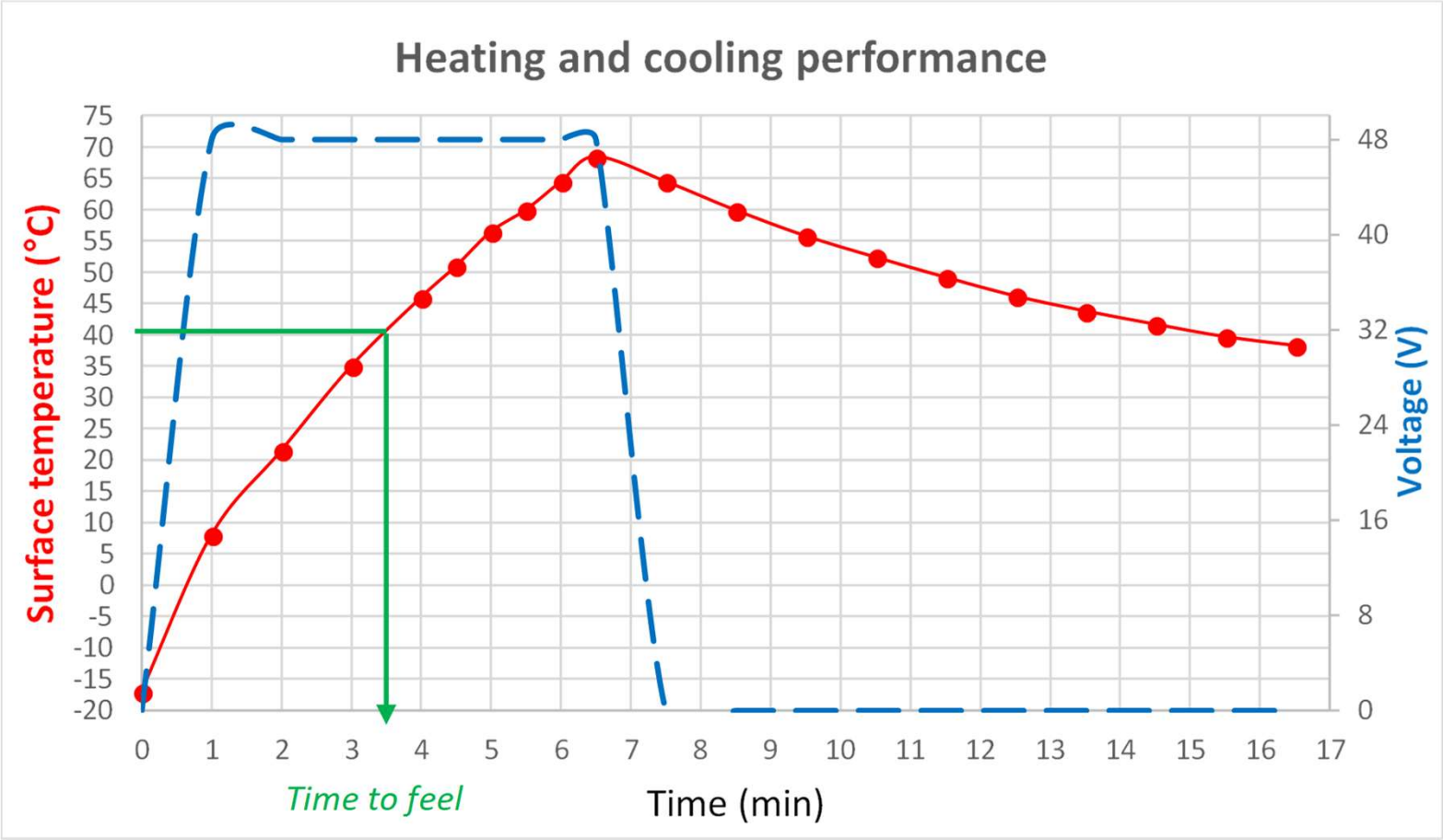
Patent pending

Why uniform heating? → *Optimized nanoparticles dispersion via melt compounding*



Thermoplastic conductive panels

Patent pending



Thermoplastic conductive panels

	Panel geometry	Maximum Voltage (48V)
		Fast heating
Maximum Power **(W)**	(350 x 250 x 2) mm	**120***
	(15 x 15 x 1) mm	**20**

*40W/h to keep temp at 25ºC

Thermoplastic conductive panels

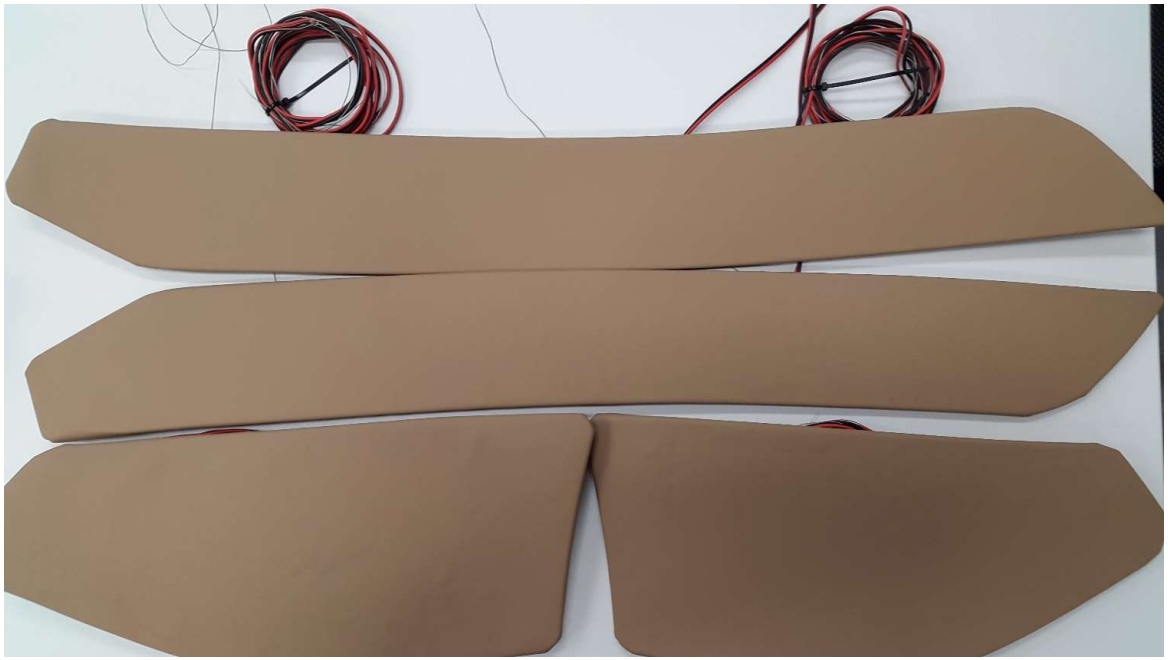
Heating homogeneity

Prototypes

DOK-ING LOOX

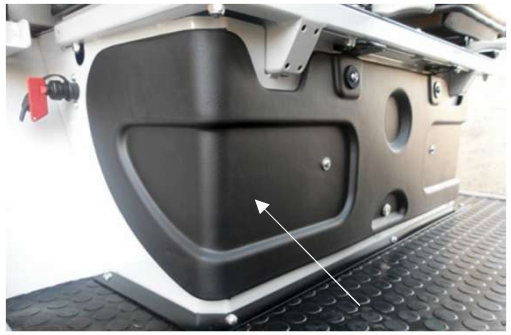
ALKE ATX210E

DOK-ING LOOX



Thermoplastic conductive panels

ALKE ATX210E



Heating coatings

- Alkè design:
  - Roof heating panels of 250x200mm (visible)
  - Floor heating panels of 250x200mm (hidden)

Total power consumption of currently developed Joule heating systems is:

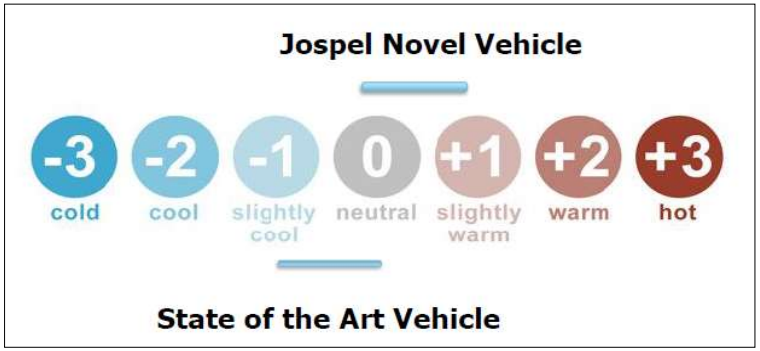
Heating Element	Power [Watts]
Door panels (4 rigid heating sheets)	126,3
Heating Floor (3 sections)	151,5
Heating Roof (2 sections)	90,4
Arm Rest	99,3
Frontal Panel	153
Heated Fresh Air	150
Total	770,5

	State of Art (W)	JOSPEL (W)
Power consumption	1150	770,5

30% energy consumption

Thermal comfort evaluation:

Climatic chamber to evaluate thermal comfort



Conclusions

- A novel and innovative heating system based on Joule effect has been developed.

- Thermoplastic heating panels and thermoset coatings fulfil automotive requirements and can be applied in different vehicle surfaces.

- Important reduction of energy consumption of HVAC systems (in comparison with current PTC heaters) has been achieved.

- Improved thermal comfort

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