hkpc 生產力局

創優增值 55 YEARS DELIVERING VALUES

Advanced Plastic Materials and Processing

Ir Samson SUEN
General Manager,
Smart Manufacturing

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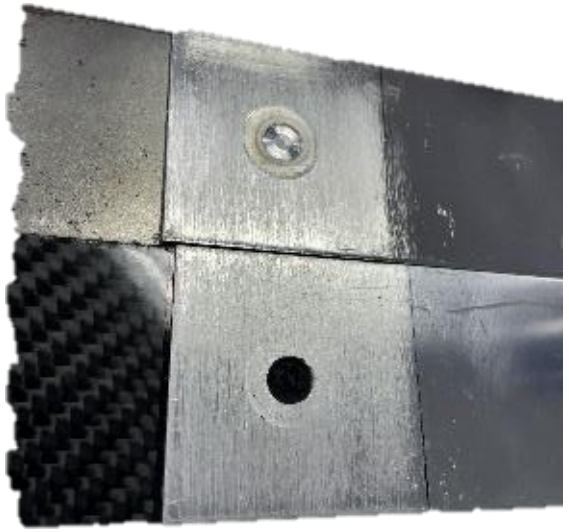
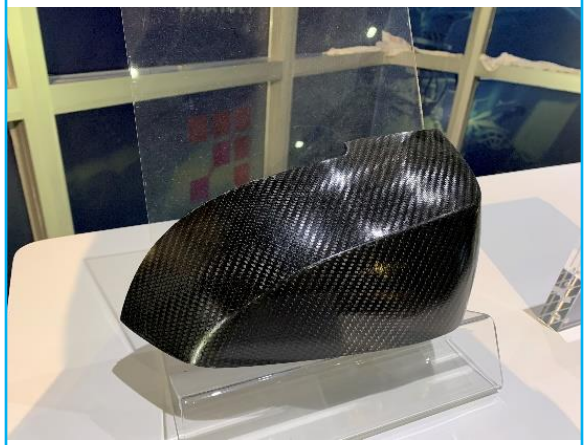
01

Lightweight Materials



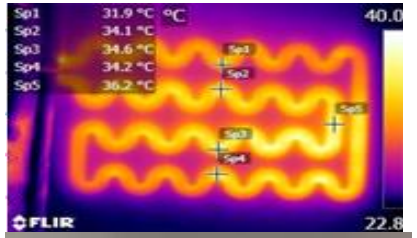


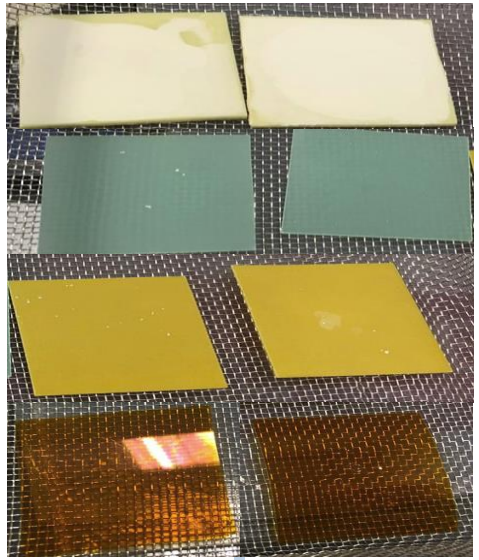
02

High Strength Martials

03

Functional Coating Technologies





04

Advanced Materials & Recycling Composite

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Carbon Composite Materials – Lightweight and High Strength

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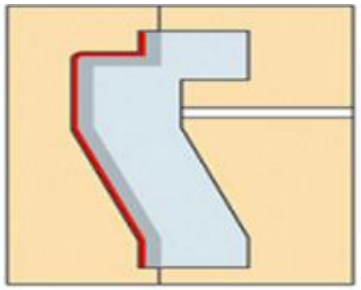
Part Manufacturing

Development of Pre-heat Hybrid Moulding

Pre-heating



Thermoplastic injection moulding

Finished goods

Pre-heat hybrid moulding

Thermoplastic based carbon prepreg

Thermoplastics

Carbon Fabric

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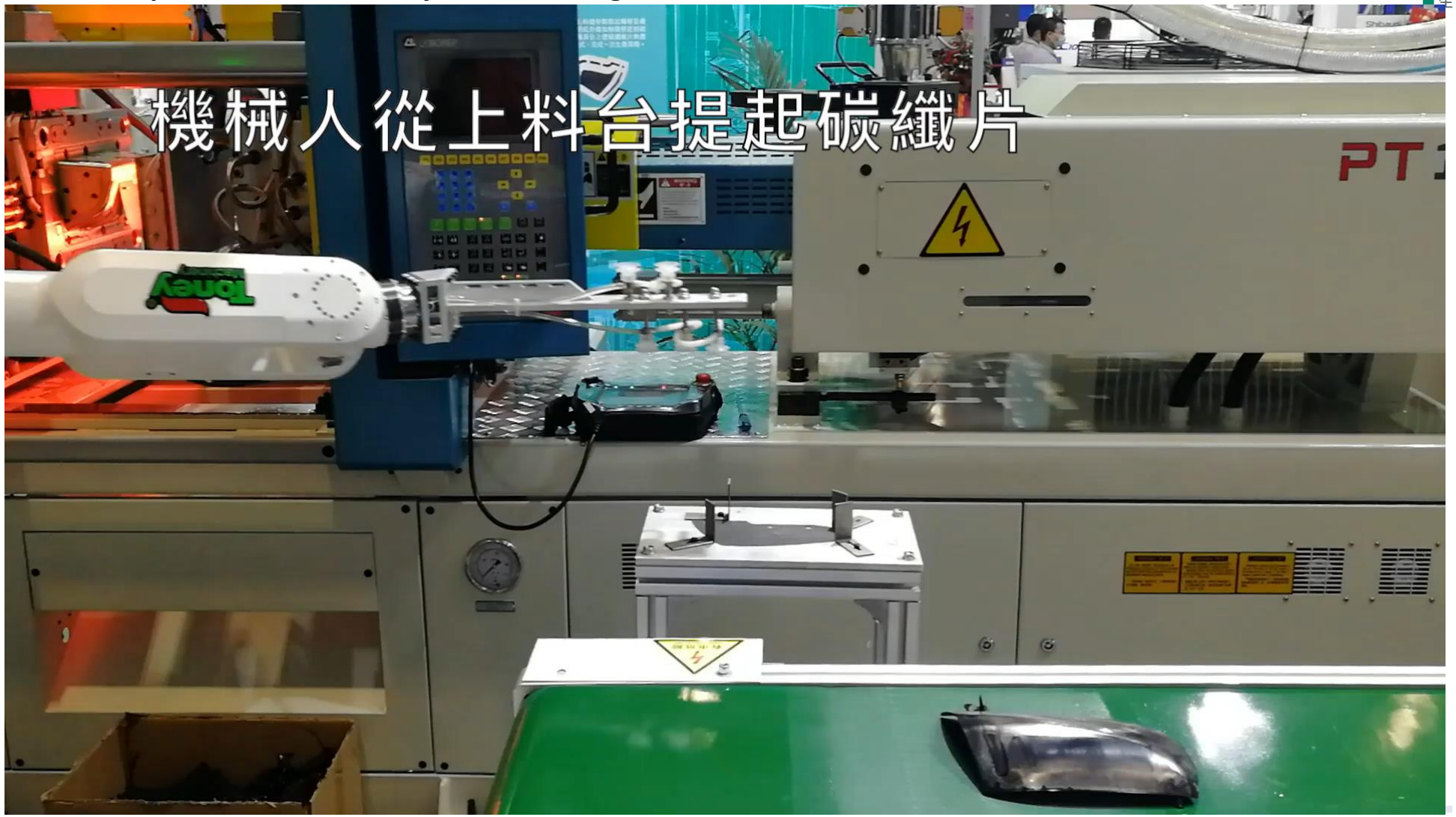
Part Manufacturing

Development of Pre-heat Hybrid Moulding

Video is twice as fast.



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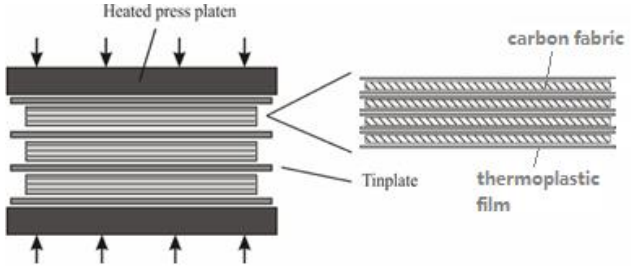
Part Manufacturing

Thermoplastic Carbon Fibre Prepeg by Film Stacking

- A thermoplastic carbon composite production method commonly used in research laboratory
- Non-continuous production method for material development



Simple Setup + Standard Machines + Commercially Available Materials = **Low Cost Easy-to-use Flexible**

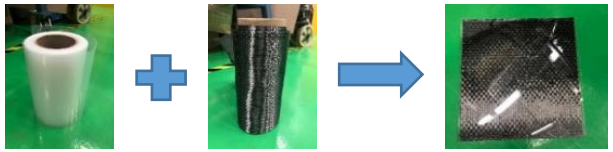
Key Process

Film stacking

- To stack up the sheet layers of carbon fiber mat / thermoplastic sheet

Consolidation

- To consolidate the stacked film by heat and pressure



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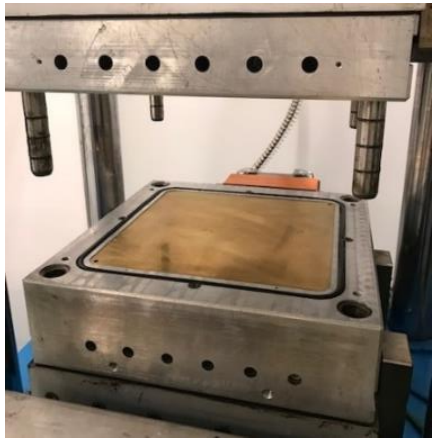
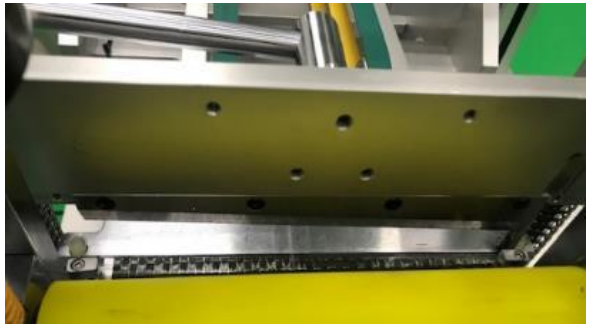
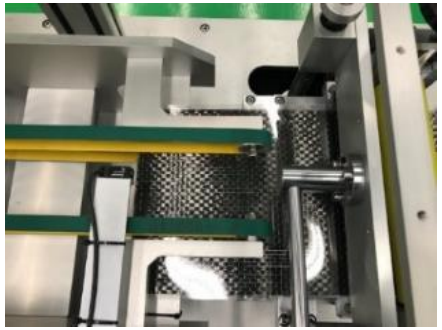


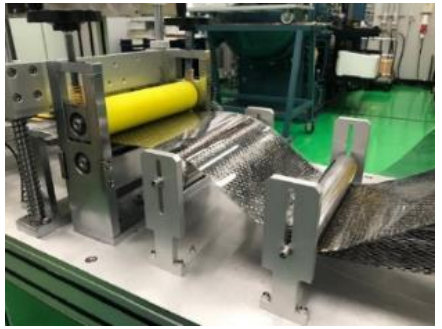
Material Rack



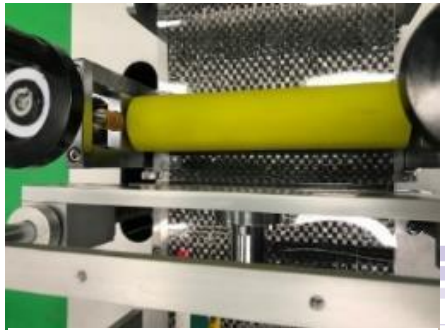
Cutter



Measuring Sensor (Length)



Feeding Roller



Guiding Mechanism

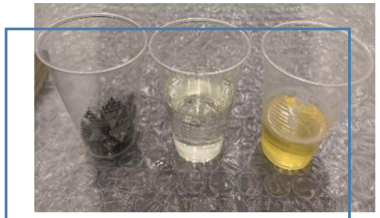
Part Manufacturing

Composite Forging Technology

A unique technology which involves using a paste of fibers mixed with a resin to be squeezed out into various forms

Characteristics:

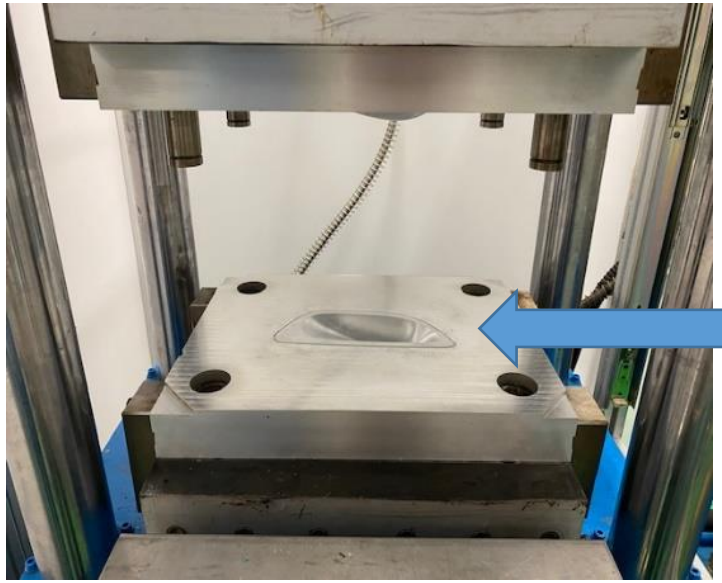
- Require no careful cutting and precise laying
- Require no trimming of composite fabric required, i.e. zero waste
- Can be produced in minutes instead of hours, i.e. shorter cycle time
- Can be molded into much more complex geometries



Material Preparation

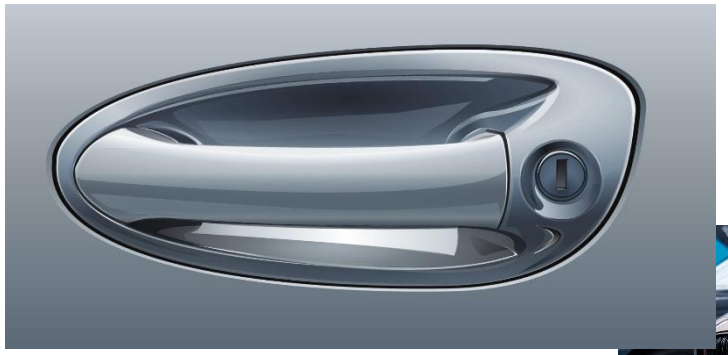
Semi-finished Product

Processing – hot press moulding



Prototype

Application



Refill Friction Stir Spot Welding (RFSSW) for Dissimilar Materials Joining Technology

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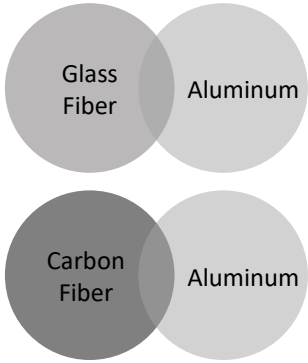
Technology Features

- Dissimilar Materials Joining
- Low Cost for Processing
- Low Materials Waste
- Customised Material Selection
- Customised Thickness Ratio

Feasible Material Combination

- Steel-Aluminum
- Aluminum-Aluminum
- Aluminum-Magnesium
- CFRP-Aluminum
- GFRP-Aluminum

Welding different materials together



Manual operation method

Retrofitting to milling machines

Retrofitting to robotic arms

Welding different materials together for vehicle frame

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One Step Method for Electroplating - Rapid 1 Step Plastic Plating Technology

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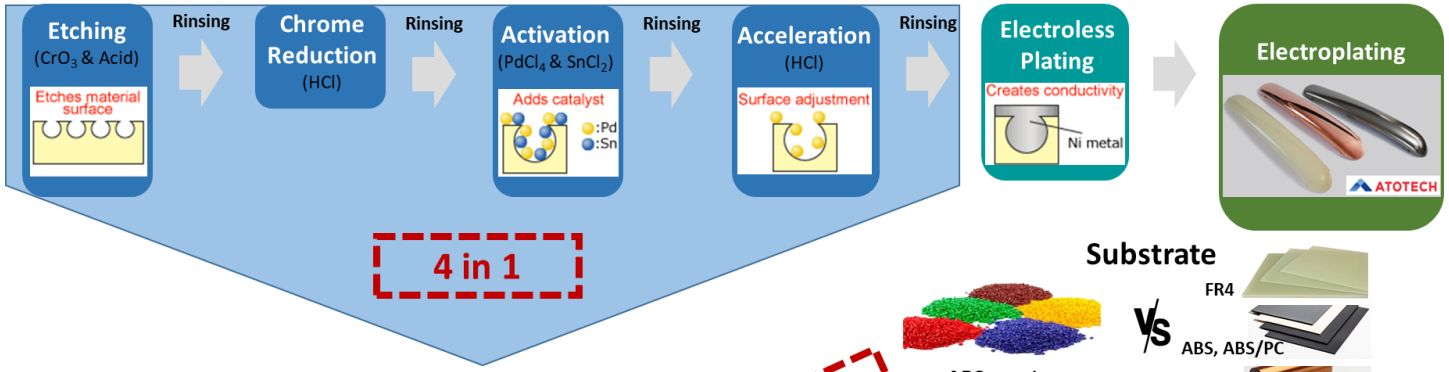
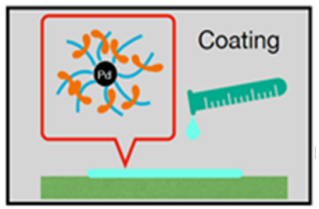
Rapid 1 Step Plastic Plating Technology

Conventional

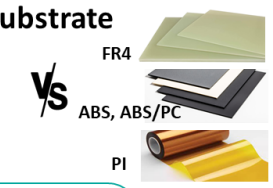


One Step Film-Forming



ABS, ABS/PC

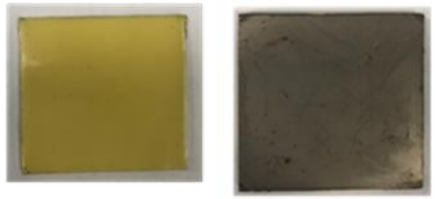
Substrate



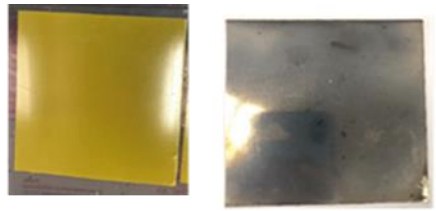
Advantage

- Simplified procedure
- Wide range of materials
- Eco-friendly
- Lower cost

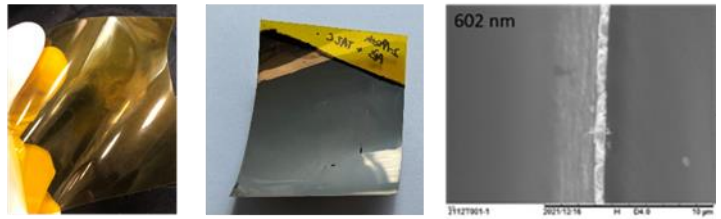
Acrylonitrile Butadiene Styrene (ABS)



Glass Epoxy (FR4)



Polyimide (PI)



Metallization of Plastic Parts

Application: PCB & FPC manufacturing (FR4, PI)

One Step Film-Forming

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High Performance Plastics - Graphene Applications for Automotive Cabin Heating

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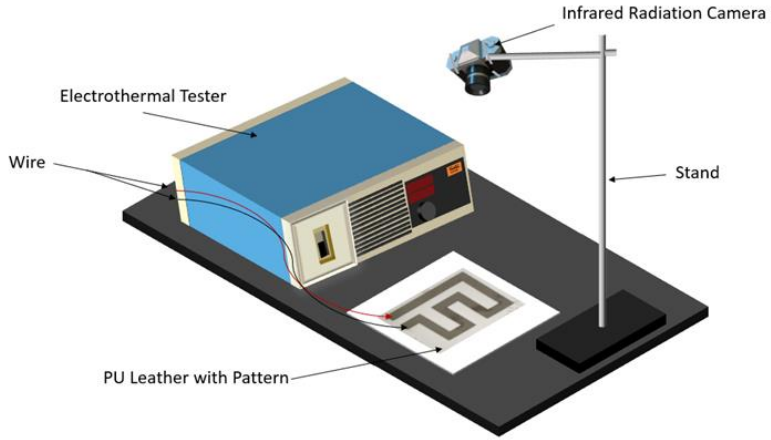
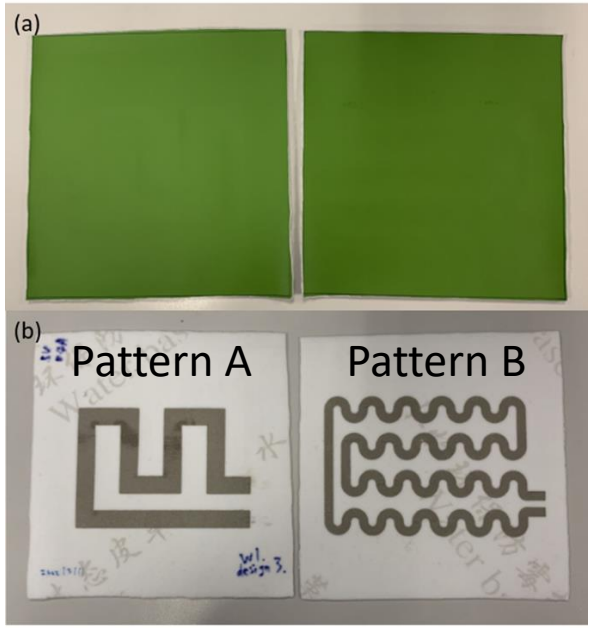
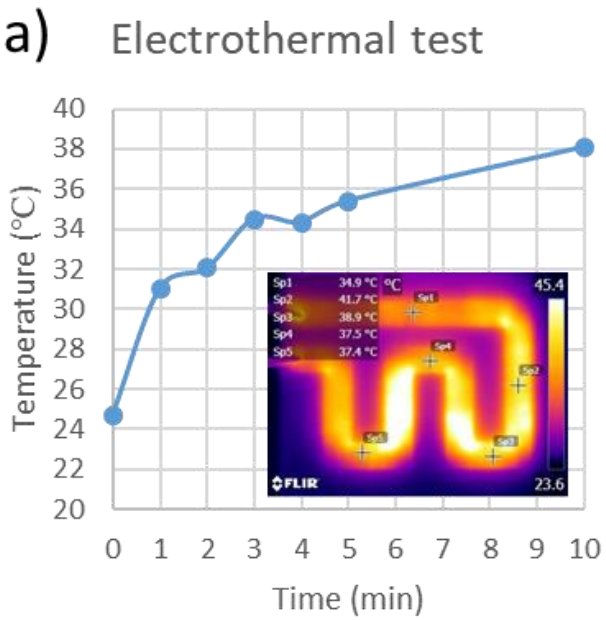
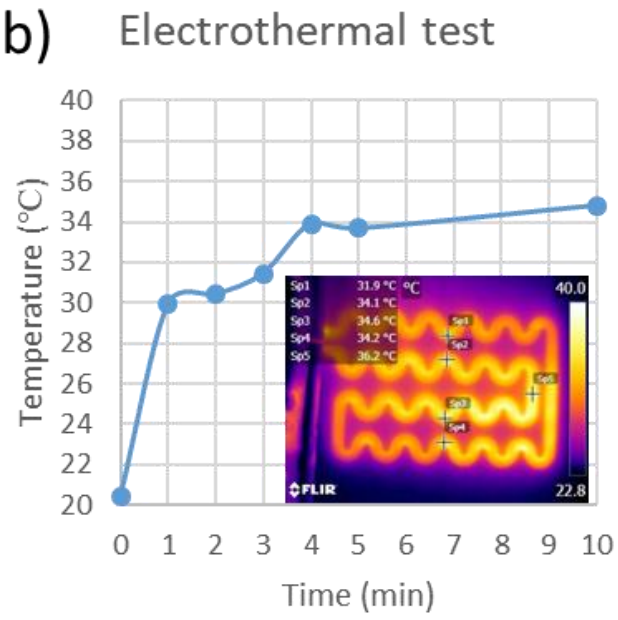
The 15 x 15 cm Prototype with Heating Temperature Control









- Temperature: Pattern A > Pattern B
- Heating uniformity: pattern B > Pattern A

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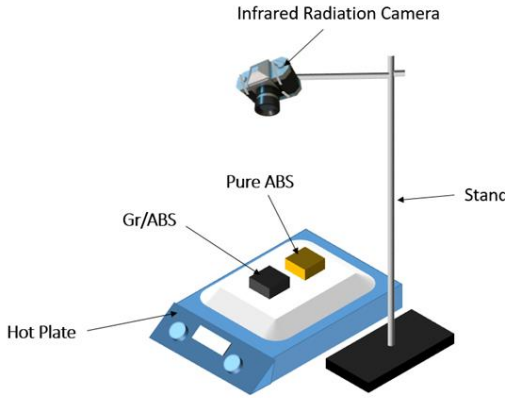
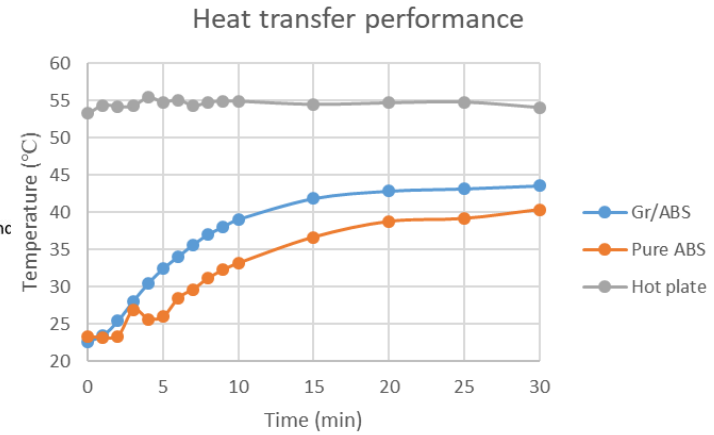
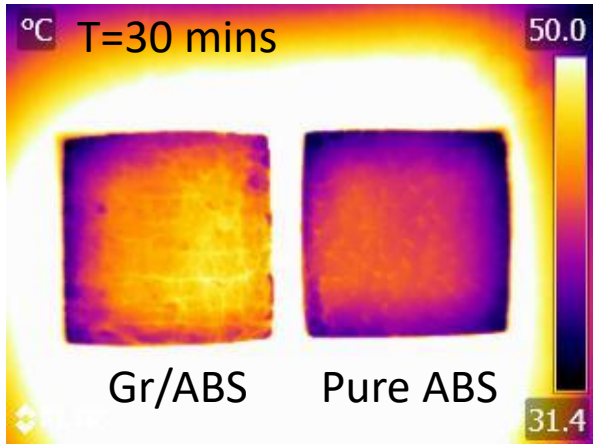
Graphene-Polymer Composites Prototype





- Hot plate (55 °C)
- The data was recorded every minute in the first 10 minutes and 5 minutes from 10 minutes until 30 minutes.



- Gr/ABS sample can reach higher temperature than pure ABS sample

Technology trends in developing Interior heating parts

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Composite Recycling

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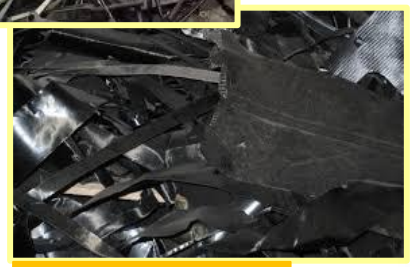
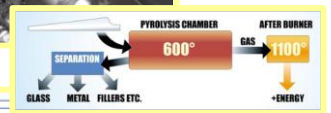
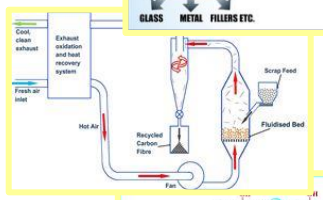
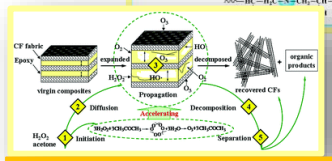
Composite Recycling



Composite Scrap

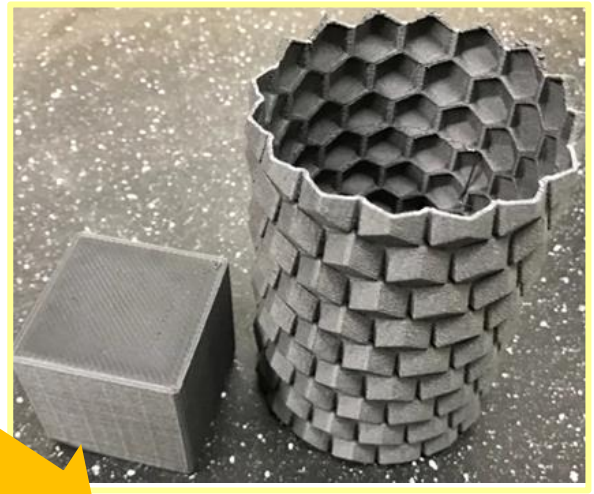






Various Recycling Process

Recycled Materials



Products by Recycled Carbon Composites

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Part Manufacturing

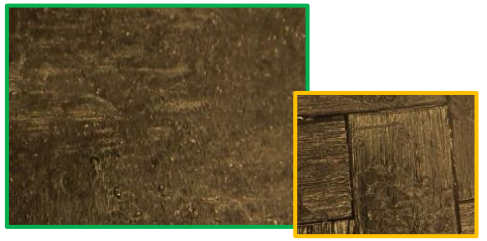
Recycling of Carbon Composites

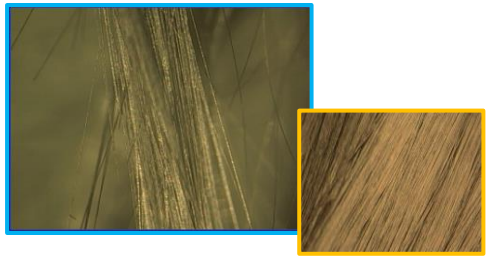
Surface Cleanliness of Recycled Carbon Fibre

Mechanical Recycling

Chemical Recycling

Thermal Recycling





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Anti-counterfeiting ID on Plastics

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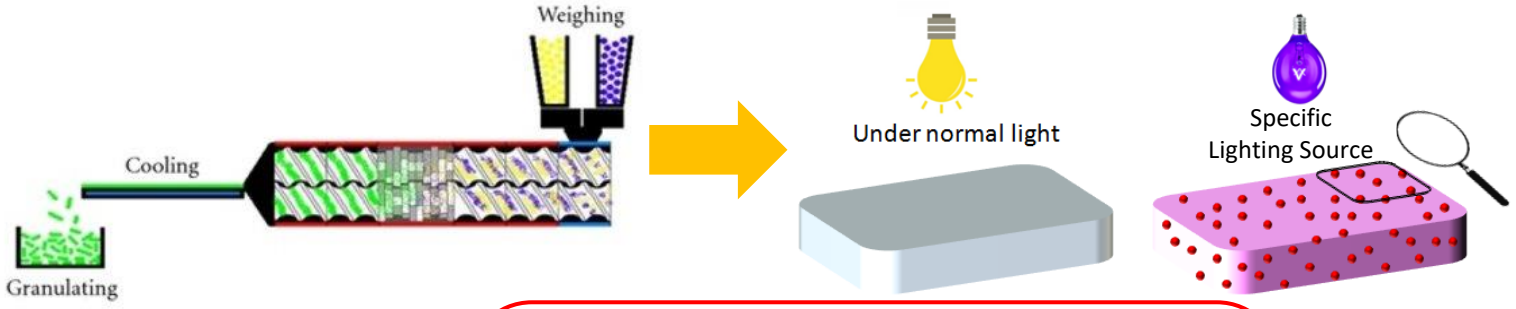
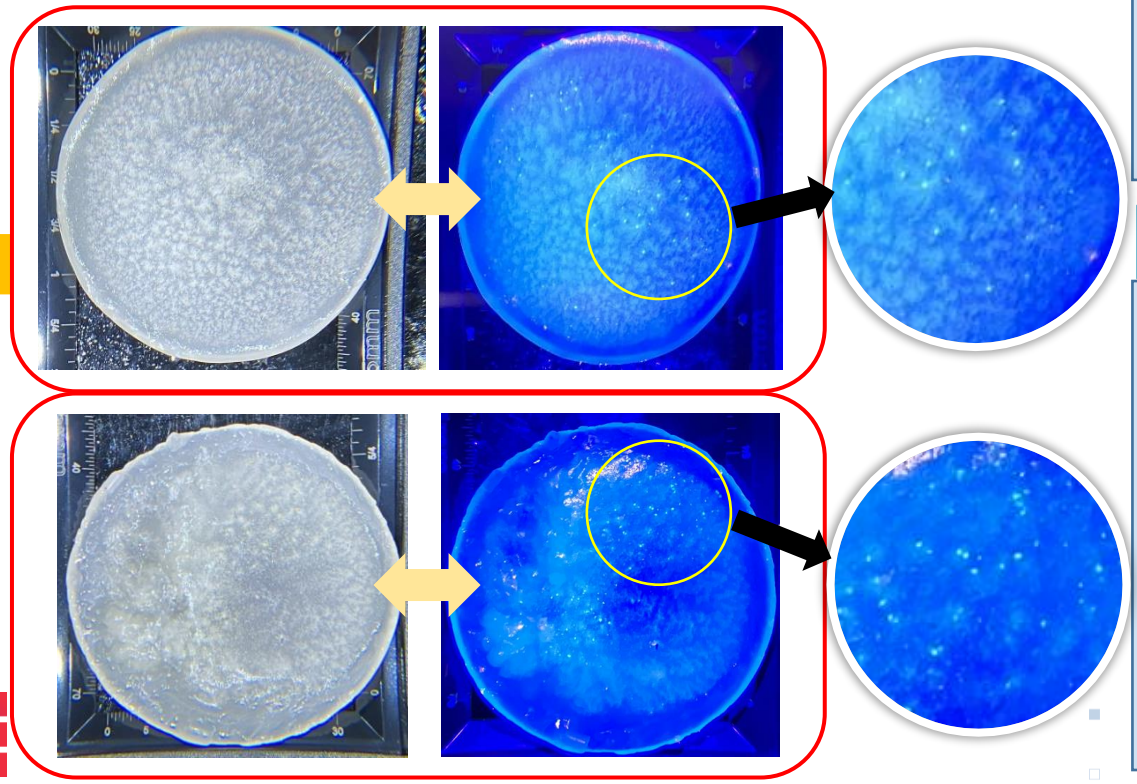
Anti-counterfeiting ID on Plastics



Unclonable ID
Random patterns



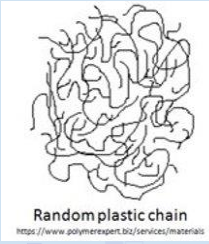
Problem Statement

- Difficult to distinguish counterfeit products by observing the packages and appearance feature.
- OEM companies suffer from
  - Recall of products /penalty claims from Tier 1 supplier
- Common anti-counterfeit features, e.g., Label, RFID, printing, etc., are clonable
- Only High-cost solution is available on the market

Proposal's Technology Innovation

Technology Innovation

- **Anti-counterfeiting feature into plastic materials**
- Unclonable - utilizing the random patterns of plastic molecular chain
- Indestructible - fluorescence tag fingerprint anti-counterfeiting patterns
- Convenient to verification – easy to operate, verification under UV light
- Affordable



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Thank you

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