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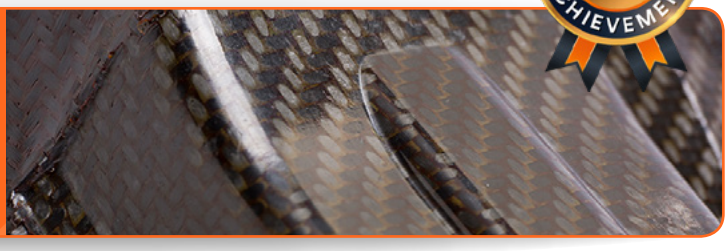
surface engineering

Cidetec / Top Achievement
3R LEADING TECHNOLOGY

Reprocessable, Repairable and Recyclable: Materials with an endless lifespan



A new generation of Reprocessable, Repairable and Recyclable high-performance fibre-reinforced thermoset composites.

Designed and synthesized by CIDETEC Surface Engineering, they can be manufactured following traditional methods but the resulting material can be reprocessed, repaired and recycled.

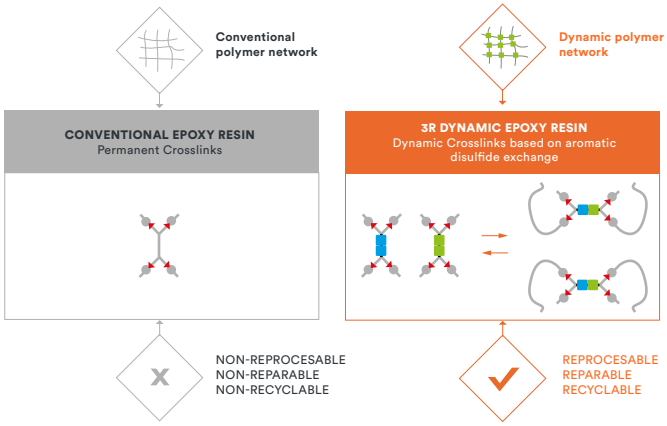
WO2015181054A1

"Thermomechanically reprocessable epoxy composites and processes for their manufacturing"

Concept

CIDETEC has developed a new family of enhanced thermoset resins and composites that preserve all the advantages of conventional thermosets while showing unprecedented features such as Re-processability, Reparability and Recyclability (3R technology).

3R epoxy resins and composites are obtained by using dynamic hardeners (commercially available products) which create reversible crosslinks in the polymer matrix.



The reshuffling capacity of such reversible crosslinks is responsible of all the smart properties (Re-procesability, Reparability and Recyclability) of the cured 3R composite.

3R REPROCESSING, REPAIRING, RECYCLING OF CURED LAMINATES

Re-processing

3R laminates can be heated 80ºC above the Tg and re-shaped in a few minutes applying pressure, which allows the thermoforming of cured 3R laminates to obtain 3D geometries, in a similar way to thermoplastic composites.

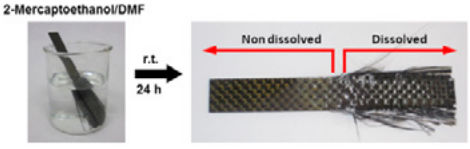
Repairing

Due to the reshuffling capacity of the dynamic crosslinks, repair of damages based on resin/fibre delaminations and resin micro-cracks are also possible by applying heat and pressure to the damaged part, with a full recovery of the initial properties.

Recycling

Mechanical recycling: Based on the reshuffling capacity of the dynamic crosslinks, the cured 3R composite can be ground into flakes or pellets which can then be reprocessed by heating 80ºC above the Tg and pressing, obtaining a new short fibre reinforced 3R composites.

Chemical recycling: 3R epoxy resins can be completely disrupted by the addition of a specific chemical agent. Thus, the resin can be totally dissolved without affecting the reinforcement. In this way, it wil be possible to recover the pristine fibre.



Opportunities

Manufacturing cost savings due to faster and more automated production compared to conventional methods (mainly autoclave).

Reparation of parts delaminated either during the manufacturing process or in service, which currently are rejected due to high cost.

Possibility of recycling the parts at the EoL (not possible with current conventional CCs).

The new FRPCs are easily synthesized from readily available materials and could therefore be implemented in a straightforward manner in transportation, energy or construction industries, among others.

AUTOMOTION
AEROSPACE
CONSTRUCTION
INDUSTRIAL PROCESSES

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