AUTOMOTIVE

Polymer-based composites

10_AUTO_PBC_FRA-TP

Title: Fire resistance additives for continuous fiber thermoplastics

Description: Develop additives to give fire resistant properties to continuous fiber thermoplastics. There is a market to develop composite battery housings (top cover or base plate) of BEV (battery electric vehicles). The housings must have fire resistant properties for thermal runaway of batteries and/or protection of batteries from external fire. Describe clearly your challenge. Current solutions are in metal (steel or aluminum) or in some case in thermoset composites. Fire resistant TP composites could reduce the CO_2 footprint of the car and be easier to recycle than thermosets. Composite solutions could be lighter than metals.

Additives should be proposed to be mixed with thermoplastics (PP or PA6). It should not limit the impregnation of the reinforcing fibers (glass in priority) with a high fiber content of 60-70 wt%.

Scope:

- No available "ready to use" additives that have the potential to improve the fire resistance of continuous fiber thermoplastics (PP or PA6) without limiting the fiber content and without reducing drastically the mechanical properties of the composite (strength, modulus, resistance to impact, thermal and ageing behavior)
- Initial objective is to have a UL94V0 classification of the composite with a glass content of 60 wt% of continuous fibers for PP and/or for PA6
- Cost of the additive should be "acceptable" for the automotive industry

Objective:

- L94V0 classification of the TP composite
- Reduction of mechanical performance is less than 10% vs. composite without fire additive
- Cost premium is limited to max 10% vs composite without additive

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11_AUTO_PBC_FRA-TS

Title: Fire resistance additives for continuous fiber thermosets (epoxy-glass)

Description: Develop additives to give fire resistant properties to continuous fiber thermosets

There is a market to develop composite battery housings (top cover or base plate) of BEV (battery electric vehicles). The housings must have fire resistant properties for thermal runaway of batteries and/or protection of batteries from external fire.

Current solutions are in metal (steel or aluminum). Fire resistant thermoset composites could reduce the CO_2 footprint of the car. Composite solutions could be lighter than metals.

Additives should be proposed to be mixed with epoxy for use in a wet pressing process where epoxy is poured on glass fabrics and the impregnated fabrics are transferred in a mold for curing. The additive should not limit the impregnation of the reinforcing fibers (glass in priority) with a high fiber content of 60-70 wt%.

Scope:

- Available "ready to use" additives that have the potential to improve the fire resistance of epoxy resin reduce drastically the mechanical properties of the composite (strength, modulus, resistance to impact, thermal and ageing behavior) or reduce significantly the glass transition of the composite
- Initial objective is to have a UL94V0 classification of the composite with a glass content of 60 wt% of continuous fibers for epoxy
- Cost of the additive should be "acceptable" for the automotive industry

Objectives:

- UL94V0 classification of the composite
- Reduction of mechanical performance is less than 10% vs. composite without fire additive
- Tg of the composite is above 100°C
- Cost premium is limited to max 10% vs composite without additive

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12_AUTO_PBC_AdhesiveFilm

Title: Adhesive film to allow structural bonding of composite with metal part during ecoat process

Description: The standard process to manufacture a car is to weld steel part together to make a body in white that is protected for corrosion and painted. The integration of composite parts in a steel body in white is difficult and is today mainly done with adhesive bonding. In that case a liquid adhesive is dispensed on the composite which is then pressed on the metal structure. The adhesive cures in the oven that is used after the ecoat process. This process limits the geometry of the parts that can be assembled and the process is difficult to control.

The challenge proposed here is to develop an adhesive that could be solid when the composite is placed in contact with the metal body. Ideally the adhesive would be placed in the mold when the composite part is molded. The adhesive would then cure when the BIW is placed in an oven around 200°C for a duration of around 15 minutes to create a structural bond between the metal and the composite. Solutions for thermoset and/or thermoplastic composites are of interest.

Hybrid metal/composites structures have a high potential for weight savings

Scope:

- Create a structural bond between a steel part and a composite part (thermoset or thermoplastic) without liquid adhesive and use oven of ecoat process to cure the adhesive the bond between steel and composite. The adhesive should be dry and as a solid thin layer at the surface of the composite to make the assembly process easier for the automotive OEM
- Structural bonding with values of bond around 25 Mpa in simple shear test at new and reduction of less than 25% after wet ageing
- Cost of the additive should be “acceptable” for the automotive industry

Objective:

- Adhesive is delivered as a roll of material (solid)
- Adhesive cures at 200°C in 10 minutes
- Bond between composite and steel is structural (shear strength of 25 Mpa).
- Good resistance of the adhesive after thermal (range -30°C to 80°C) and/or wet ageing
- Cost of the adhesive is compatible with automotive targets

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13_AUTO_PBC_RESeat

Title: Novel child seat components made of recycled thermoplastic fiber reinforced plastic

Description: Development of child seat components with high crash performance for automotive application. New technology combines particle foaming, injection moulding and local continuous fibre reinforcement. This particle-foam composite injection molding (PCIM) process overs a weight and CO_2 saving of up to 30 percent. Re-use of recycled thermoplastic tapes for injection molding of FRP molded component improves CO_2 footprint of the manufacturing process.

This is a challenge in terms of material and technology. It is declared to use recyclates (re-use of thermoplastics tapes) for the child seat production. The product fulfills the criteria of a hybrid composite and combining production technologies and joining various materials, which is important for lightweight composites. Main objective – the development of thermoforming and injection molding in combination with particle forming is new, this is the challenge.

Scope:

- Weight and CO_2 saving of up to 30 percent
- Excellent crash performance for automotive application
- Energy-efficient production process (one instead of two manufacturing processes = CO_2 saving) by Particle-foam composite injection molding
- (Re-)Use of recycled thermoplastic tapes for injection molding of FRP molded com-ponent
- Partner for product design is a child seat manufacturer based in Poland

Objective:

- Main objective: the development of thermoforming and injection molding in combi-nation with particle forming
- Development of a functional demonstrator based on a head rest of a child seat (The challenge focuses us on the head rest of the child seat. This is the main component of the child seat with high requirements to crash safety and it's a perfect technology demonstrator. For that reason, the predicted budget is suitable.)
- Development of re-use technology of thermoplastic tapes
- Material analysis and selection
- Topology optimization and numerical design of the structure
- Development of a thermoforming and injection molding tool as well as a particle foaming tool
- Implementation and optimization of the manufacturing process
- Crash tests of the technology demonstrator

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14_AUTO_PBC_SUSDELI

Title: Sustainable design for lightweighted & easy-to-recycle «front end module» automotive parts

Description: FEM parts are structural and multi-component automotive parts widely used in passenger and commercial vehicles. The challenge giver manufactures different types of FEM parts for different OEMs. Most of these parts are manufactured by overmolding onto metal inserts so that part can withstand necessary amount of deformation during its lifetime. Metal inserts and plastic material which is used in FEM parts have high value however recycling of these parts is quite challenging both for scraps and EoL.

FEM parts have a lightweight potential since including metal components and new design can make possible to recycle these parts without intensive labor force and at the end lower CO_2 emissions will be generated.

Scope:

- Replacing current design with new ones, considering design for sustainability. Upgrading the design by developing a new assembly technology which makes separation of components feasible.
- Replacing metal components with fiber reinforced thermoplastics. By doing this new part can be mechanically recycled if the fiber reinforced composites can comprise of same resin.

Objectives:

- Finding a solution to replace current design with new sustainable one which can be different way of metal-plastic bonding, using adhesives etc. By doing this, CO_2 emissions can be reduced and lighter parts can be manufactured.
- Developing new material which is suitable for replacing metal inserts in FEM parts. New material needs to be suitable for current production line and be compatible with plastic resin (PPGF) commonly used in FEM parts.

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