A137

Material

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Prerequisites	• Systems Catalogue • Systems Knowledge

Overview[edit | edit source]

Materials are any raw materials that are converted into the finished part during manufacturing. This includes reinforcements, matrix polymers, cores, and other auxiliary materials. Consumables are also used during manufacturing but, unlike raw materials, are not incorporated in the final product. The combination of material and shape define the part, and thereby control the outcome sensitivity of the system (i.e. how the part will respond to the conditions of a given process step). Raw materials can be added in stages at particular steps of the manufacturing process. For instance, in liquid composite moulding (LCM), the fiber reinforcement is laid down during a material deposition step and then liquid resin is introduced during a following impregnation step. In any factory workflow, depending on the process steps, materials may be deposited, shaped, consolidated, transformed, machined, etc. To truly define a process step, one must understand how the part, considering both material and shape, will interact with the tooling and equipment[1]. In order to understand which materials may be used for a given part or manufacturing process, navigate to the Practice volume, where the practice for selecting a material system is provided.

This page lists and provides links to individual pages concerning all composite material constituents. The content of the material catalogue volume pages is intended to assist with the purchasing of these materials.

To learn about a specific material, navigate to explore this area further at the bottom of this page. Included here is an alphabetical list of all material pages on the KPC. To learn about any of the

materials, click on the appropriate link.

To learn more about materials parameters navigate to the following link (note that more information is included in the level II tab).

- Material parameters

To learn how materials may influence manufacturing outcomes, click on the links below.

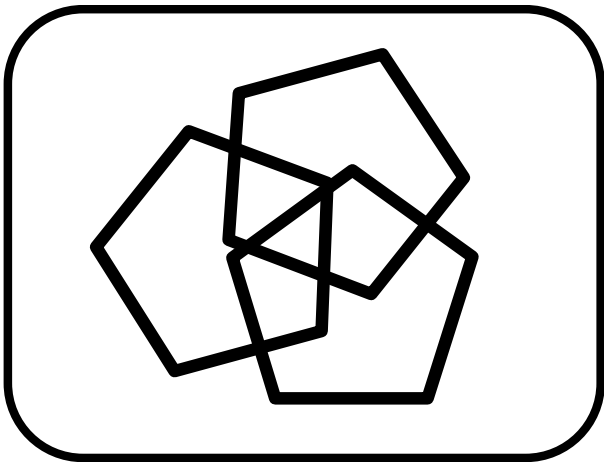
- Effect of material in a thermal management system
- *Material effects for other manufacturing themes are coming soon*

Explore this area further

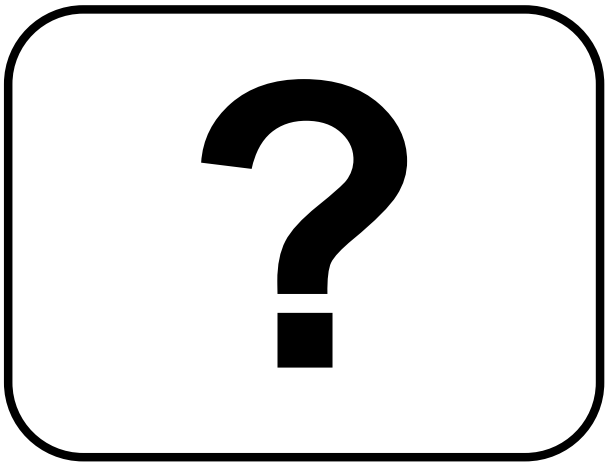
- Material - A137
  - Cores & inserts - A202
    - Foam - A328
    - Honeycomb - A326
  - Prepreg - A171
  - Matrix - A138
    - Fire Retardant Resins/Additives - A345
    - Epoxy resin - A113
    - Polyester resin - A103

References

1. ↑ [Ref] Fabris, Janna Noemi (2018). *A Framework for Formalizing Science Based Composites Manufacturing Practice* (Thesis). The University of British Columbia, Vancouver. doi:10.14288/1.0372787.



About



Help

The continuous material phase that binds the reinforcement together, maintains shape, transfers load, protects the reinforcement from environment and damage, and provides the composite support in compression.

Desirable characteristics:

- Moisture/chemical resistance
- Low density
- Processability

Engineered materials (designed to have specific properties) made from two or more constituent materials with different physical or chemical properties. The constituents remain separate and distinct on a macroscopic level within the finished structure.

Liquid Composite Moulding (LCM), a family of infusion processes refers to processes that saturate a dry reinforcement that is on/in the mould by means of a pressure differential (injection pressure, vacuum, combination of both).

For polymer matrix composites (PMCs), resin refers to the matrix; the continuous material phase that binds the reinforcement together, maintains shape, and transfers load. Resins are divided into two main groups: thermosets and thermoplastics.

Any manufacturing and/or decision making activity that occurs during any stage of the development design cycle (e.g. conceptual design to production).

In the context of Knowledge in Practice, practice refers to the systematic use of science based knowledge to reduce composites manufacturing risk, cost, and development time.

Outcomes represent the range of response/sensitivity to factory system attributes. Those that fail to satisfy manufacturing requirements are known as defects. Examples of manufacturing outcomes include process parameter outcomes, material structure outcomes, and material performance outcomes.