

A172

Thermal transformation



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Themes

- [Thermal management](#)
- [Flow and consolidation management](#)
- [Residual stress and dimensional control management](#)

Tags

- [Thermal transformation](#)
- [Process step](#)
- [Factory cell](#)

Overview[[edit](#) | [edit source](#)]

Thermal transformation is a process step that uses heat to chemically or physically transform a material in order to achieve the as-designed properties. The physico-chemical transformations include cure of thermosets and crystallization of thermoplastics, respectively. Specific equipment are used to apply heat depending on the material properties and shape of the part. Such equipment include an autoclave, oven, hot-press, heating blanket, or others. Room temperature cure is also listed as a piece of equipment used during this step as it too relies on the transfer of thermal energy to the material in order to transform it. The equipment in this case is simply the room that the material is transformed in.

With regards to curing, there are other methods of imparting energy to the material in order to transform it to its final form. Examples include chemical energy, such as curing with ammonium hydroxide, or photochemical energy, curing using UV radiation. However, while these methods exist and are used, application of thermal energy is the most common method for transforming the material state. In fact, thermal transformation is one of the most important process steps in any composite manufacturing factory, regardless of the product being made. It is not uncommon to find multiple thermal transformation steps in a single factory. This would include process steps such as

preheating or post-curing.

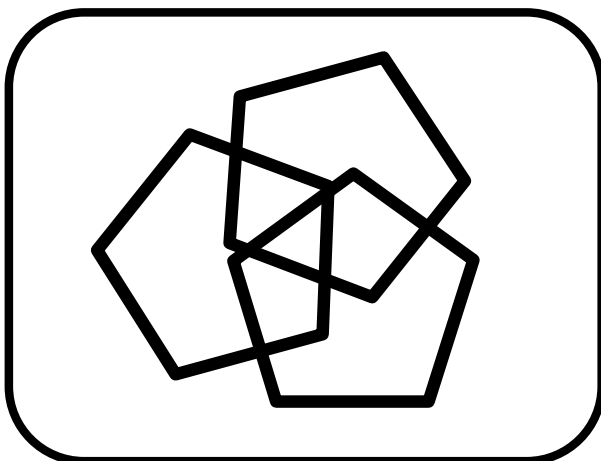
The science behind thermal transformation and thermal management of composite materials is relatively mature. As such, experimental and simulation techniques exist for developing, optimizing, or troubleshooting this crucial step.

Equipment used during thermal transformation[[edit](#) | [edit source](#)]

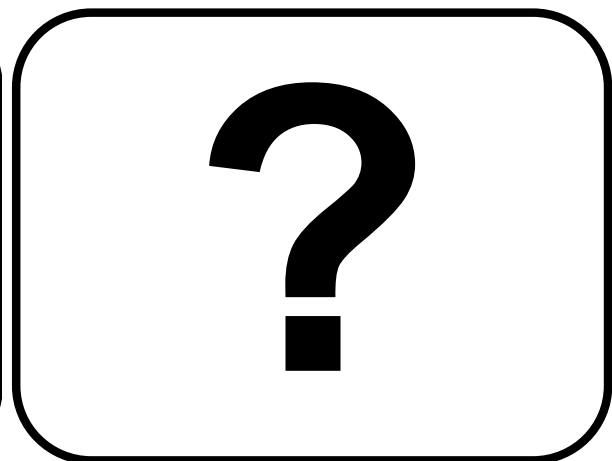
- [Autoclave - A173](#)
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Tooling and consumables used during thermal transformation[[edit](#) | [edit source](#)]

Coming soon.



About



Help

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.

A central processing theme in the manufacturing cycle. This theme is concerned with managing the thermal response of materials during storage and handling or parts/tools when they are subsequently heated.