

Low cost carbon fibres pave the way for a widespread use of carbon fibre reinforced plastics

Carbon fibres (CF) offer exceptional strength and stiffness properties and at the same time provide a low density [Mor05]. Consequently carbon fibre reinforced plastics (CFRP) are a strong lightweight alternative to conventional materials such as steel or aluminium. However, CF currently have not penetrated the high volume markets. There is a need to develop technologies enabling high volume production of low cost carbon fibre (LCCF) as the market potential is strongly dependent on the CF production costs [EWW+16]. However, production costs to date still range from 15 to 25 €/kg for traditional PAN based fibres [DWD+15]. The main cost drivers are the PAN-precursor as well as the thermal conversion processes [War11].

As a result new precursor materials and novel processing techniques have been developed to meet the goal of high volume and LCCF production. For instance, polyolefine precursors offer significant cost benefits through high carbon yield, low raw material costs and processability [Spa14]. Another approach is the substitution of the conventional convective heat transfer of the stabilization process with a microwave (MW) energy transfer. MW heating shows distinct advantages compared to traditional heating techniques. The energy is not transferred due to thermal gradients but through direct molecular interaction with the electromagnetic field [LC12]. Hence, heat is generated throughout the material's volume resulting in a more uniform heating [TC99]. Thus MW heating facilitates increased production rates and a more energy efficient conversion of electrical energy into heat [LC12].

Innovative approaches to manufacture CF have the potential to reduce costs and process time. LCCF could pave the way for a widespread use of CFRP in the industry. Possible fields of application for LCCF are the automotive industry, the energy sector (wind turbine blades and energy storage), civil infrastructure and aerospace (secondary structures) [Ebe13].

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