# Article information:

Improvement of the layer-layer adhesion in FFF 3D printed PEEK/carbon fibre composites - ScienceDirect  
<https://www.sciencedirect.com/science/article/pii/S1359835X21002542>

# Article summary:

1. The layer-layer tensile strength of FFF 3D printed CF/PEEK composites was improved more than fivefold from 6.96 MPa to 36.28 MPa by printing under favorable crystallization conditions.

2. A proof of concept study involved the 3DP of a CF/PEEK mould tooling insert for injection moulding, replacing a costly traditional metal insert to print short production runs of ABS and HIPS polymers.

3. The research provides a better understanding of the 3DP of semicrystalline materials where a well-formed crystalline phase is essential to achieve good thermomechanical properties, and the results can be applied to other advanced semi-crystalline materials and can also be useful in the optimization of SLS 3DP.

# Article rating:

Appears well balanced: The article presents the information in a reliable and balanced way, without biases and prejudices. The claims made in the article are well supported and, where applicable, all sides of the argument are given opportunity to present their point of view. The article appears trustworthy and reliable.

# Article analysis:

The article titled "Improvement of the layer-layer adhesion in FFF 3D printed PEEK/carbon fibre composites" presents a study on improving the mechanical properties of Fused Filament Fabrication (FFF) 3D printed carbon fiber reinforced polyetheretherketone (CF/PEEK) composites. The authors aim to improve the layer-to-layer adhesion of FFF parts, which is a key limitation in 3D printing, and investigate the influence of chamber temperature on mechanical and crystalline structure.

The article provides a detailed description of the materials used, methods employed, and results obtained. The authors modified an Ultimaker 2+ printer to enable printing with CF/PEEK and other high-performance materials. They investigated the effect of chamber temperature on layer-to-layer adhesion and found that printing under favorable crystallization conditions improved the layer-layer tensile strength more than fivefold from 6.96 MPa to 36.28 MPa. The authors also conducted a proof-of-concept study involving the 3DP of a CF/PEEK mold tooling insert for injection molding.

Overall, the article presents valuable insights into improving the mechanical properties of FFF 3D printed CF/PEEK composites. However, there are some potential biases and limitations in this study that need to be considered.

One-sided reporting: The article focuses solely on improving the layer-to-layer adhesion in FFF parts using modified printers with heated chambers. While this approach is effective for improving mechanical properties, it does not address other limitations in FFF printing such as poor surface finish or slow print speeds.

Unsupported claims: The authors claim that their work offers a low-cost and rapid means to produce effective tooling inserts for injection molding. However, they do not provide any cost analysis or comparison with traditional metal inserts to support this claim.

Missing points of consideration: The article does not discuss potential risks associated with modifying printers or printing with high-performance materials such as CF/PEEK. These risks include fire hazards due to high temperatures or toxic fumes released during printing.

Missing evidence for claims made: While the authors report significant improvements in layer-to-layer tensile strength by printing under favorable crystallization conditions, they do not provide evidence for how these conditions affect other mechanical properties such as flexural modulus or stress at break.

Unexplored counterarguments: The article does not explore alternative approaches to improving layer-to-layer adhesion in FFF parts such as using different infill patterns or post-processing techniques like annealing.

Promotional content: The article includes promotional content for Denroy Plastics Ltd., who supplied ABS and HIPS polymers used in injection molding trials. This may suggest a conflict of interest or bias towards promoting Denroy Plastics Ltd.'s products.

Partiality: While the authors acknowledge previous studies on PEEK crystallinity and its effect on mechanical performance, they focus solely on their own modifications to printers without considering other approaches or factors that may affect print quality.

In conclusion, while this article provides valuable insights into improving mechanical properties of F

# Topics for further research:

* Alternative approaches to improving layer-to-layer adhesion in FFF parts
* Risks associated with printing high-performance materials such as CF/PEEK
* Comparison of cost between 3D printed tooling inserts and traditional metal inserts
* Effect of printing conditions on other mechanical properties of CF/PEEK composites
* Post-processing techniques for improving FFF part quality
* Factors affecting PEEK crystallinity and mechanical performance in 3D printing

# Report location:

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