
3D-printing composites from scratch!

Oscar Rundbäck Martinsson

DIVISION OF PRODUCT DEVELOPMENT
DEPARTMENT OF DESIGN SCIENCES FACULTY OF ENGINEERING LTH
LUND UNIVERSITY

May 20, 2021

What if you could produce your own composite filaments, made out of several different materials, which either could be 3D-printed directly or stored for later distribution and use? New results say yes!

3D-printing is one of the fastest growing production methods for home makers, bringing a broad flexibility for a cheap cost and giving the ability to produce complex parts within hours. Although there is a moderately large market of materials, one of the largest limitations for small scale producers is material choices. This is the subject of the master thesis *3D Printing Composites from Raw Materials*. By combining the precision of a 3D-printer with the extrusion capabilities of a polymer screw extruder to construct a printer that can mix plastic pellets or scraps with additives such as metal powder or color pigments.

Traditionally, when someone wanted to try new material compositions such as adding metals or other materials, they would have to contract a larger producer to manufacture a large amount of composite filament which costs a lot of money and could take months to deliver. Now, all a producer would have to do is to pour in the wanted materials into their 3D-printer and print using the new material within minutes!

By enabling a home producer to create their own composites, the possibilities to produce and test new materials are endless! A maker could, for example, create a composite of plastic and metal, as in figure 1 where aluminium has been embedded into Polylactide (PLA) to create a material which conducts heat and electric current at a largely improved rate compared to pure PLA. Other materials tested in the project include wollastonite, a fibrous material that improve the stretching capabilities of the plastic, greatly improving ductility.

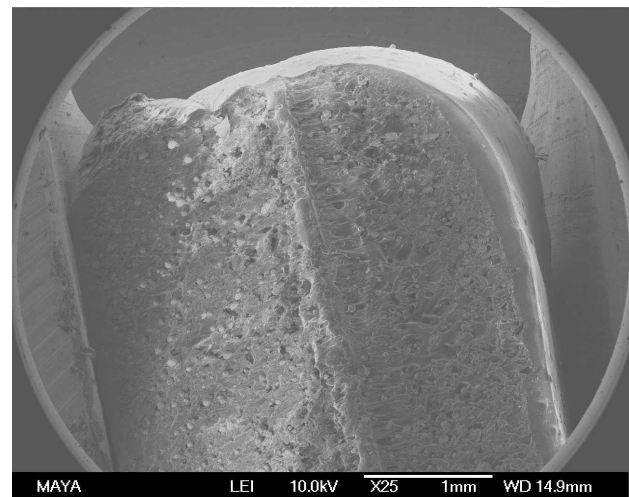


Figure 1: PLA/Aluminium composite

The constructed module can even be mounted in a special casing, allowing it to function as a small-scale extruder, creating filament which can be stored for later use, allowing for pre-production and even small scale distribution of the material! This produced material even matches the high quality which is found in commercially available filament, rivalling large scale producers without compromising on yield strength of the created part.

This project is a great step forward and opens up a completely new world of possibilities for small-scale producers, increasing the equality in one of the most democratic production methods in existence!

Oscar Rundbäck Martinsson
3D-Printing Composites from Raw Materials