

# Preparation and 3D printing of high-thermal-conductivity continuous mesophase-pitch-based carbon fiber/epoxy composites

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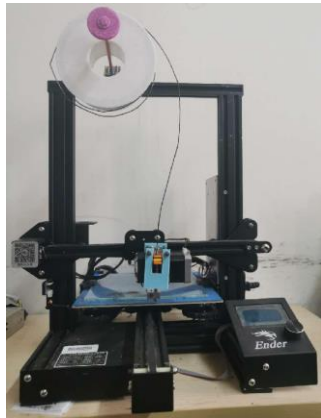
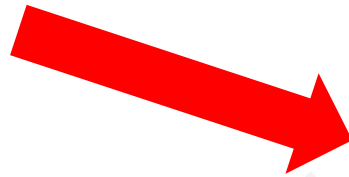
<https://doi.org/10.1631/jzus.A2200413>

# CMPCF and 3D printer



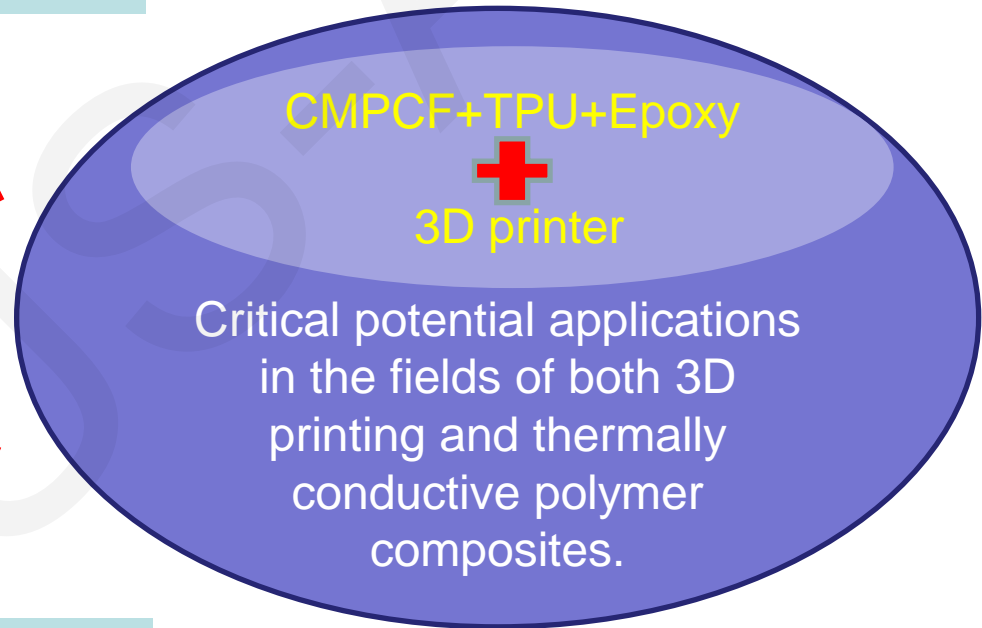
Continuous mesophase-pitch-based carbon fiber (CMPCF)

High-thermal-conductivity composite filament

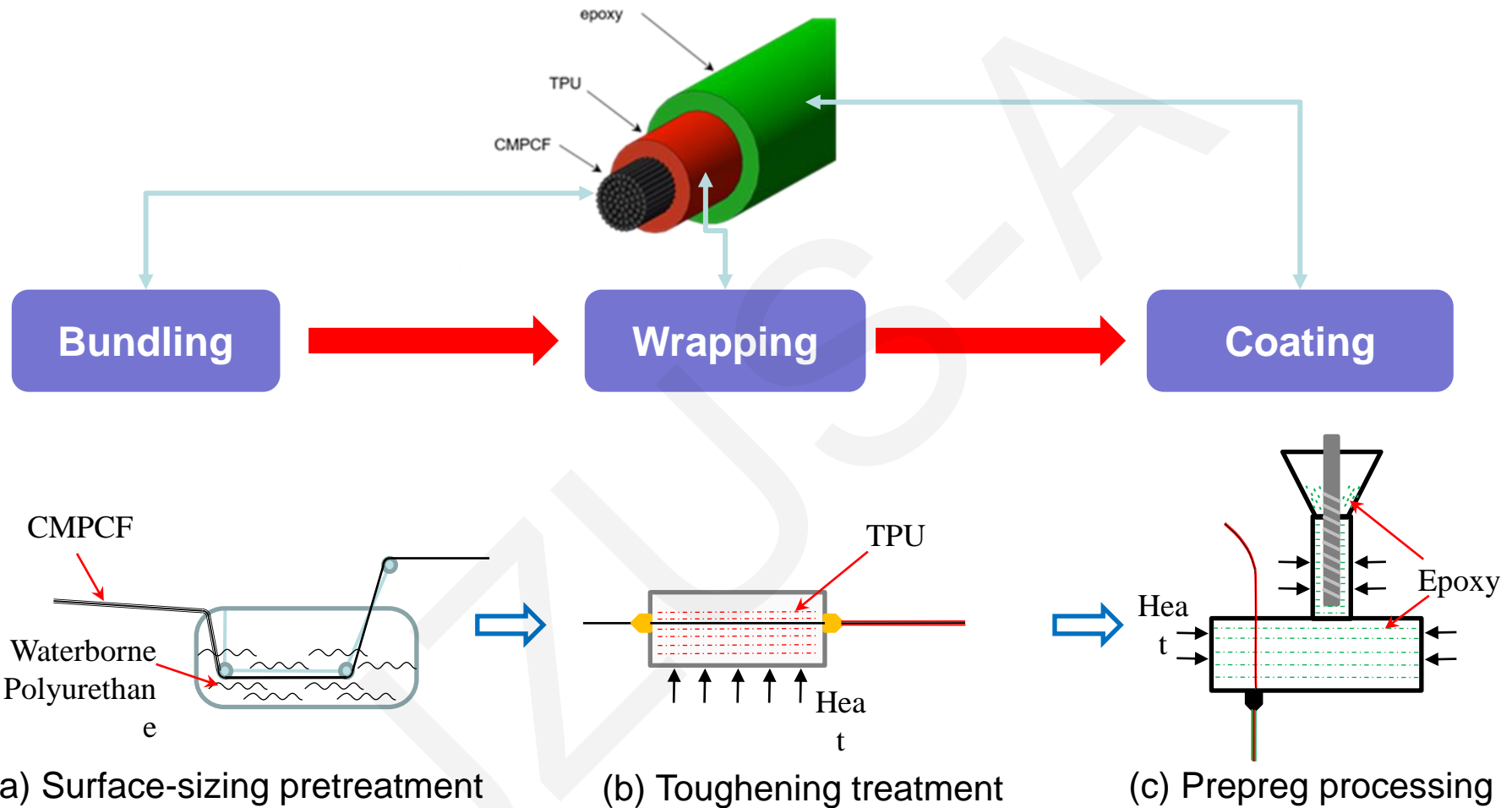


3D printer

Control the composite filament laying direction



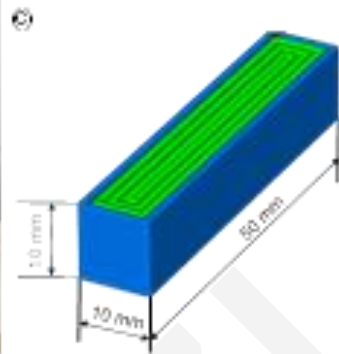
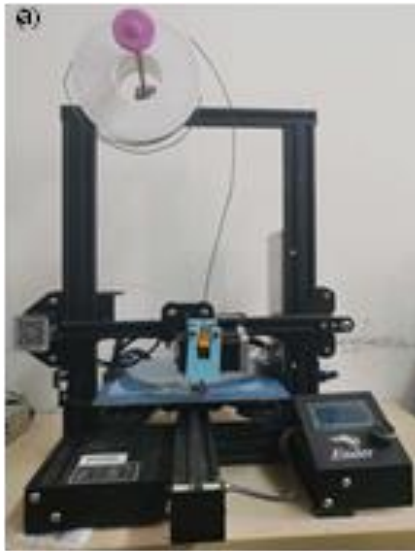
# How to make CMPCF printable



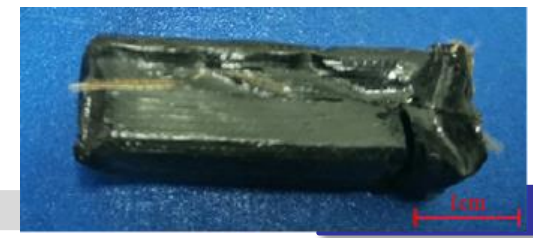
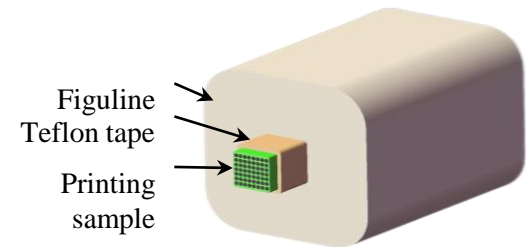
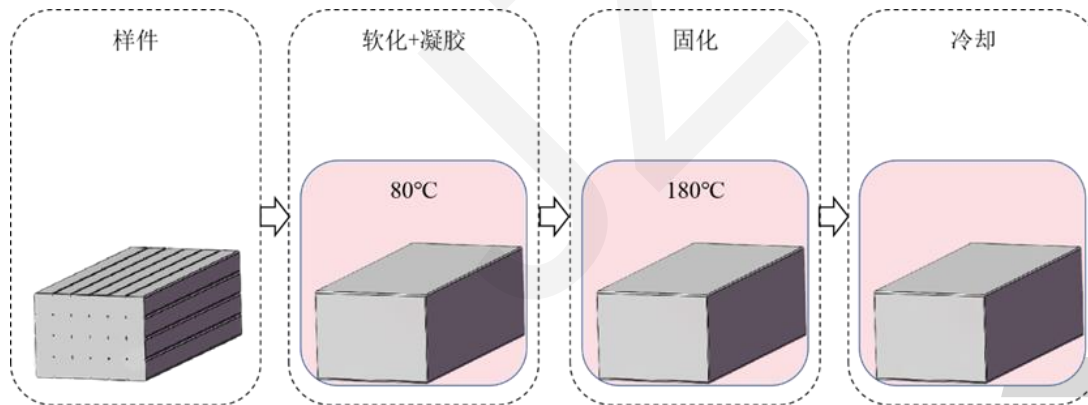
**Preparation process schematic of composite filaments**

# Printing and curing of composite filaments

## ■ Printing process

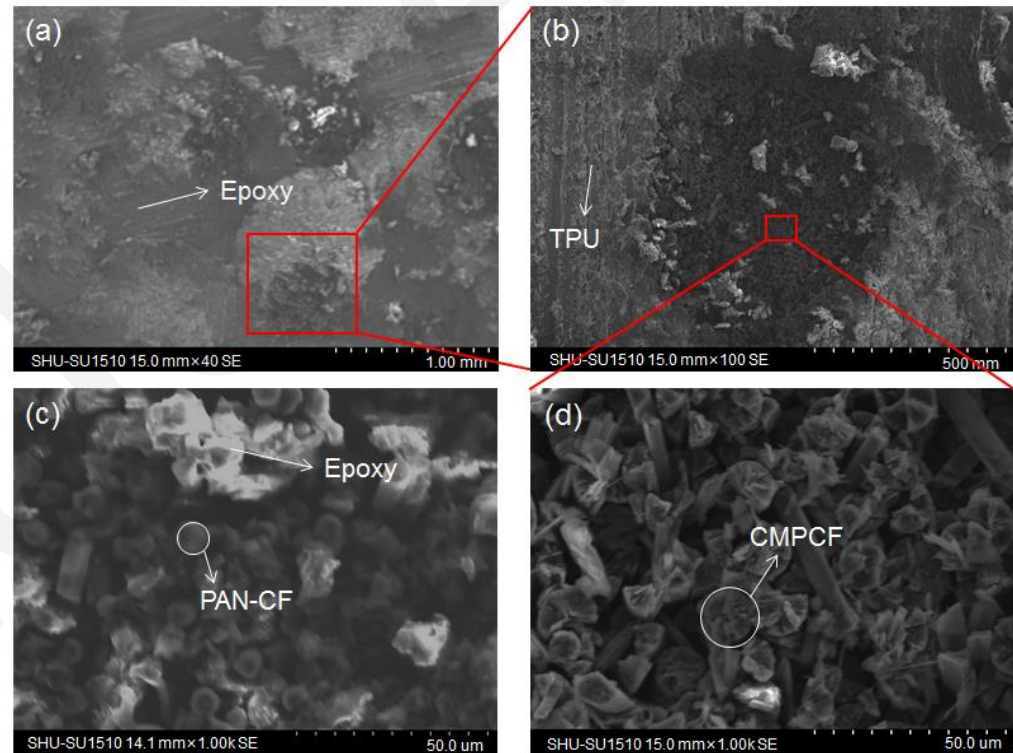
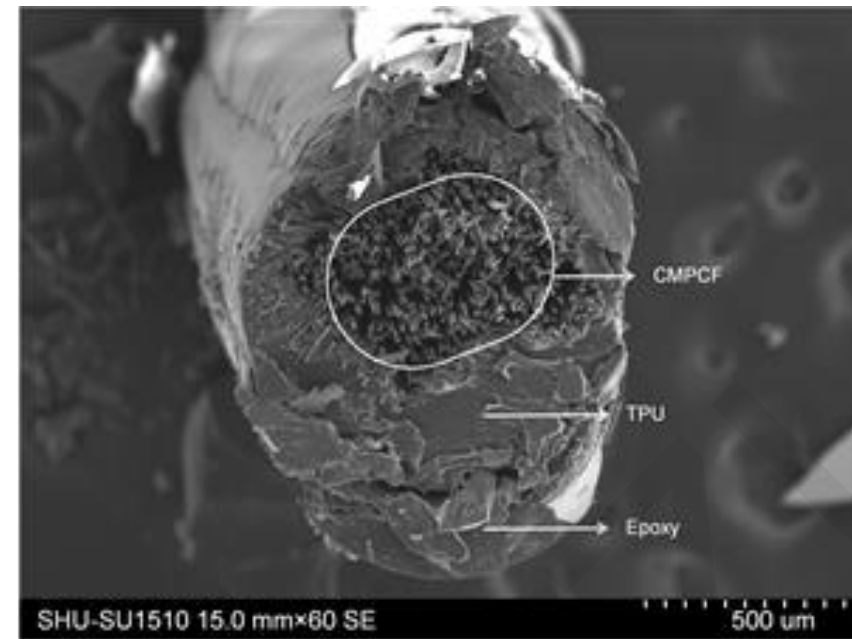


## ■ Curing process



# Testing and Results

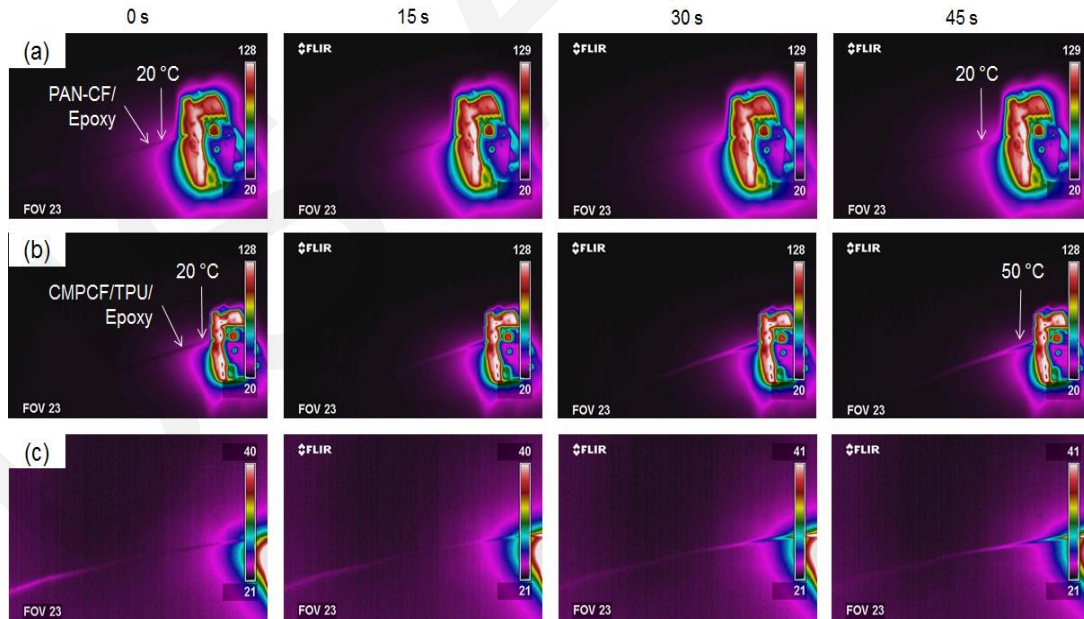
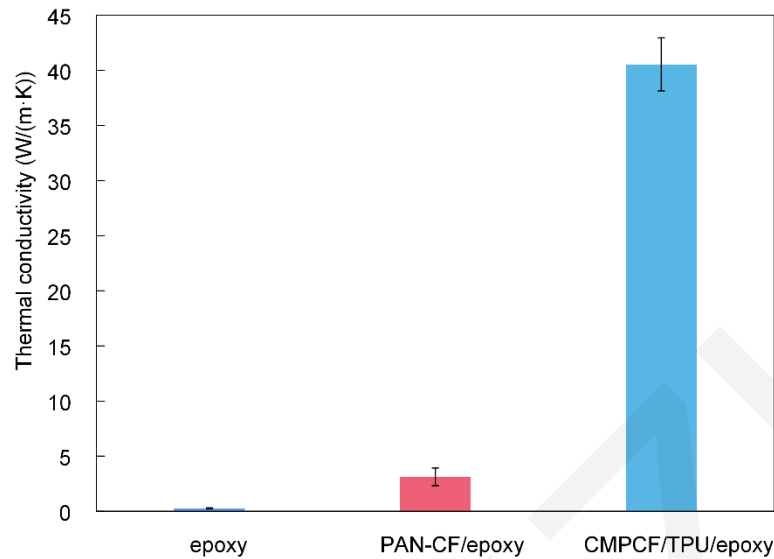
## SEM image of CMPCF/TPU/epoxy composite filament



## SEM images for CMPCF/TPU/epoxy and PAN-CF/epoxy

# Testing and Results

## ■ Thermal conductivity test



**Thermal conductivity of epoxy resin and composites and infrared thermal images of CMPCF/TPU/epoxy and PAN-CF/epoxy.**

# Discussion

## ■ Analysis of the composite filament

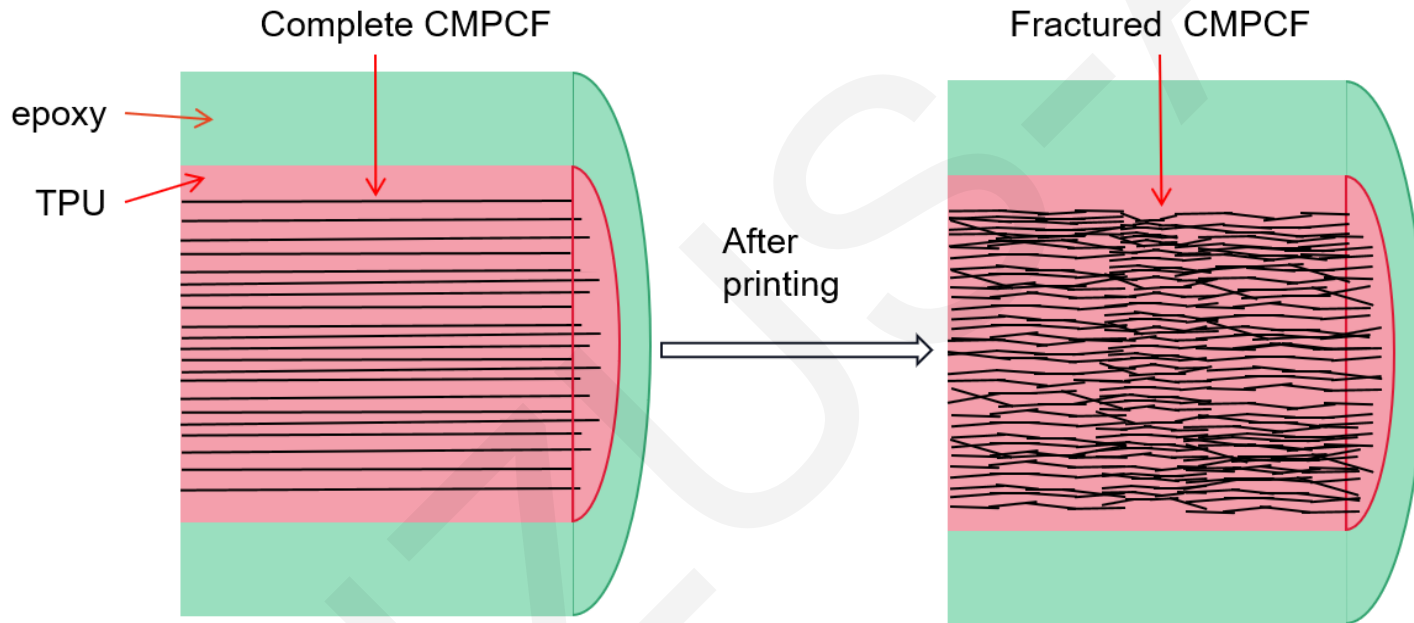


Illustration of CMPCF fracture.

# Conclusions

- ✓ **CMPCF/TPU/epoxy composite filament with high thermal conductivity was successfully prepared by surface sizing, toughening pretreatment, and prepreg processing of CMPCF.**
- ✓ **Three-dimensional printing enables the laying of fibers along the direction of thermal conductivity.**
- ✓ **The tensile strength of the CMPCF/TPU/epoxy composite filament was about 73% lower than that of the PAN-CF/epoxy composite filament.**
- ✓ **When the volume content of CMPCF was only 6.6%, the thermal conductivity of the composites was 40.549 W/(m·K).**