



Supplementary Materials for

Mimicking transmural helical cardiomyofibre orientation using Bouligand-like pore structures in ice-templated collagen scaffolds

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Videos S1 to S3

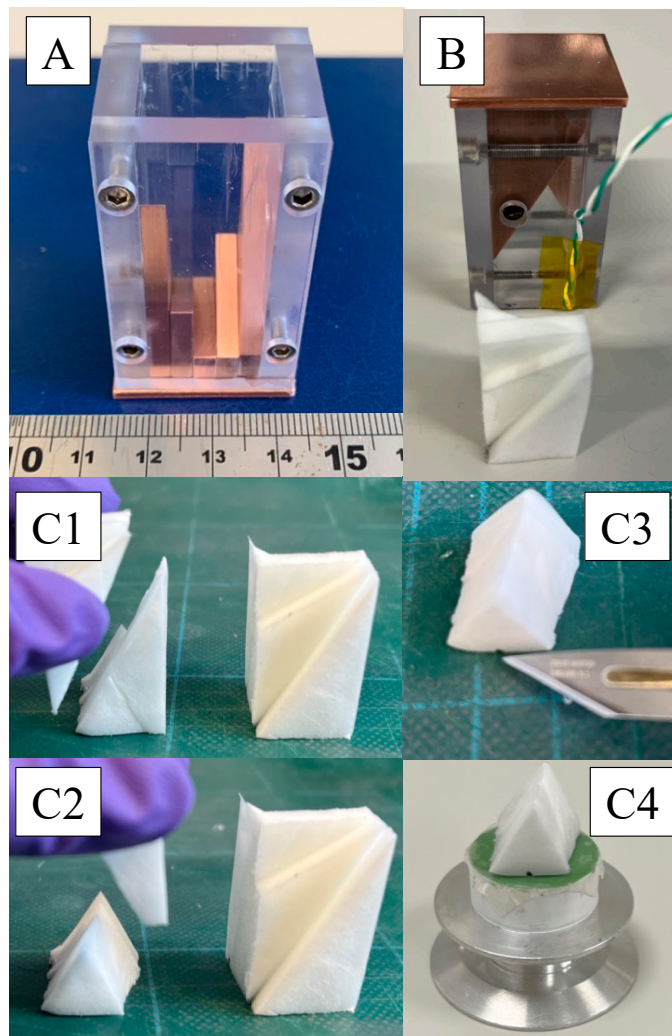


Fig. S1. The overview of the prototype mould and sample preparation for X-ray microtomography (μ CT).

(A) The prototype mould. (B) The freeze-dried scaffold in dry state just taken out of the mould. (C) Detailed steps to cut the sample into the prism volume of interest for μ CT imaging. (C1-2) Cutting of excess collagen near the base on the left hand side with the uncut sample on the right hand side. (C3) A black dot was to mark the prism positioning. (C4) The sample was mounted with double-sided tape onto the sample stage for μ CT imaging.

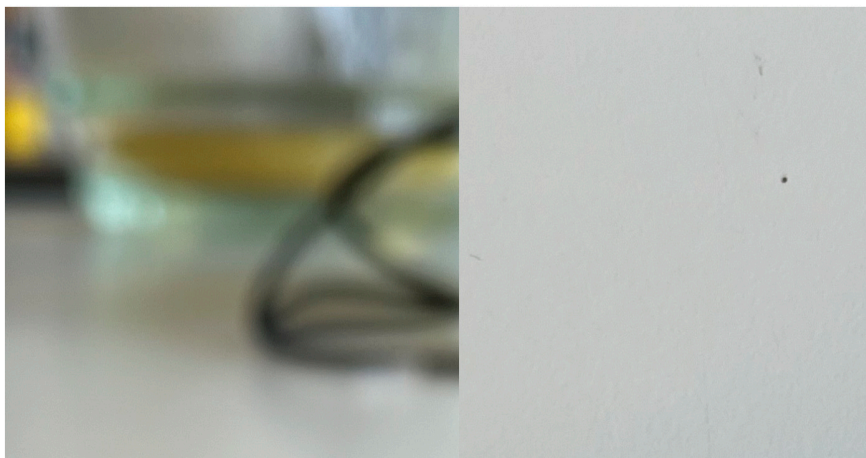


Fig. S2. The overview of the refined mould.

Table S1.

Thermal properties of the finite element simulation.

Parameter	Value	Description	Temperature-dependency
k_w	$0.6 \text{ W m}^{-1} \text{ K}^{-1}$	Thermal conductivity of water	No
k_{Cu}	$401 \text{ W m}^{-1} \text{ K}^{-1}$	Thermal conductivity of copper	No
k_p	$0.2 \text{ W m}^{-1} \text{ K}^{-1}$	Thermal conductivity of polycarbonate	No
k_i	$2.2 - 0.05T \text{ W m}^{-1} \text{ K}^{-1}$	Thermal conductivity of ice	Yes
cp_w	$4200 \text{ J kg}^{-1} \text{ K}^{-1}$	Specific heat capacity of water	No
cp_{Cu}	$390 \text{ J kg}^{-1} \text{ K}^{-1}$	Specific heat capacity of copper	No
cp_p	$1200 \text{ J kg}^{-1} \text{ K}^{-1}$	Specific heat capacity of polycarbonate	No
cp_i	$2100 + 0.6T \text{ J kg}^{-1} \text{ K}^{-1}$	Specific heat capacity of ice	Yes
ρ_w	997 kg m^{-3}	Density of water	No
ρ_{Cu}	8960 kg m^{-3}	Density of copper	No
ρ_p	1200 kg m^{-3}	Density of polycarbonate	No
ρ_i	918 kg m^{-3}	Density of ice	No
L	333.5 kJ kg^{-1}	Latent heat of water-ice transition	No
T_f	$0 \text{ }^\circ\text{C}$	Temperature for water-ice phase change	No
dt	$4 \text{ }^\circ\text{C}$	Temperature interval for water-ice transition	No
CR	$1 \text{ }^\circ\text{C min}^{-1}$	Cooling rate of the cold finger	No
h_c	$27.5 \text{ W m}^{-2} \text{ K}^{-1}$	Heat convection coefficient	No
T_0	$20 \text{ }^\circ\text{C}$	Initial temperature/ambient temperature	No

Video S1.

3D animation of the wedge design.

Video S2.

3D animation of the Bouligand-like orientation design.

Video S3.

The reconstructed μ CT images of the sample fabricated in the refined mould, showing a continuous pore orientation shift in region 1-5.