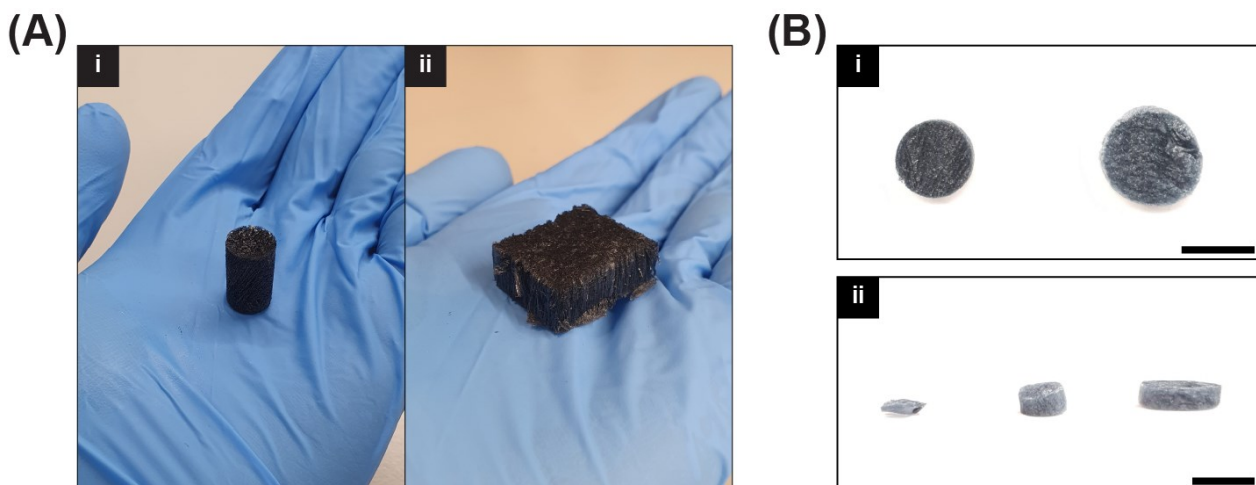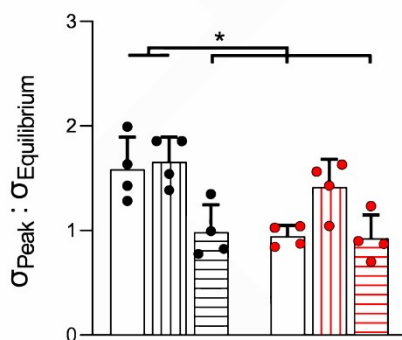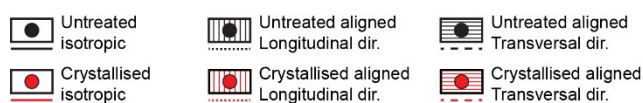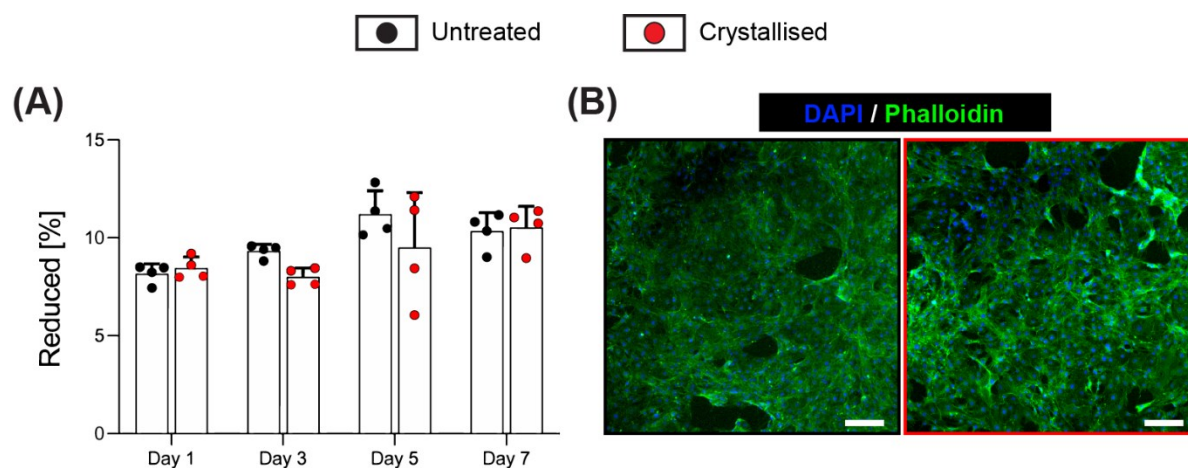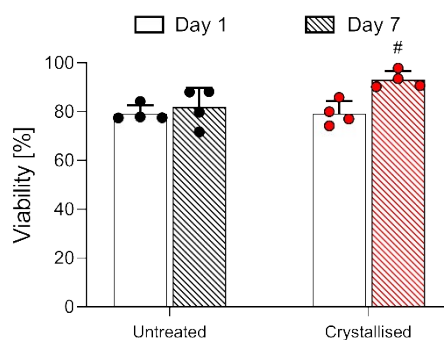## Electronic supplementary information (ESI)

Supporting Information 1. **(A)** Overview of scaffolds with an isotropic cylindrical conformation (left) and an aligned rectangular one (right). **(B i)** Evidence of volumetric expansion following sulfuric acid crystallization with an untreated sample (left) compared to a crystallized one (right). **(B ii)** Scalability of the combined freeze-drying and crystallization process, represented by a range of specimens: 8 mm diameter and 500 μm thickness (left), 8 mm diameter and 3 mm thickness (middle), 14 mm diameter and 3 mm thickness (right). Scale bars: B = 1 cm.
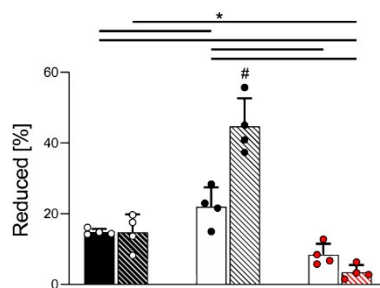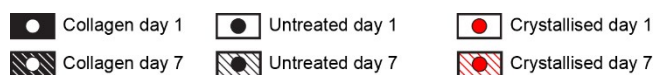

Supporting Information 2. Peak stress to Equilibrium stress ratio (n=4). Bar graphs demonstrate the mean with error bars representing standard deviation. Data values are presented as associated points. * represents statistical significance (p<0.05) between indicated groups using two-way ANOVA with Tukey's post-hoc test.

Supporting Information 3. Cytocompatibility of scaffolds on C3H10 cells via indirect contact. After the first 24 hours, growth media was replaced with extraction media for more 24 hours. **(A)** AlamarBlue™ assay performed with extraction media. Intensity being normalized to samples that were in contact with standard growth media only (n=4). **(B)** Fluorescent staining for nuclei/f-actin (DAPI and Phalloidin respectively) of day 7 groups. Scale bars: B = 100 µm. Bar graphs demonstrate the mean with error bars representing standard deviation. Data values are presented as associated points.

Supporting Information 4. Quantification of viability (extracted from Live/Dead Staining) at days 1 and 7, quantified as alive cells density (n=4). Bar graphs demonstrate the mean with error bars representing standard deviation. Data values are presented as associated points. # represent statistical significance (p<0.05) with all other groups using two-way ANOVA with Tukey's post-hoc test.

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Supporting Information 5. AlamarBlue™ assay performed on scaffolds (n=4). Bar graphs demonstrate the mean with error bars representing standard deviation. Data values are presented as associated points. * represent statistical significance ($p < 0.05$) with all other groups using two-way ANOVA with Tukey's post-hoc test.