Supplementary Information

Tuning the Functionality of Acrylated Vegetable Oil: Impact on the Physicochemical Properties of the 3D Printed Network

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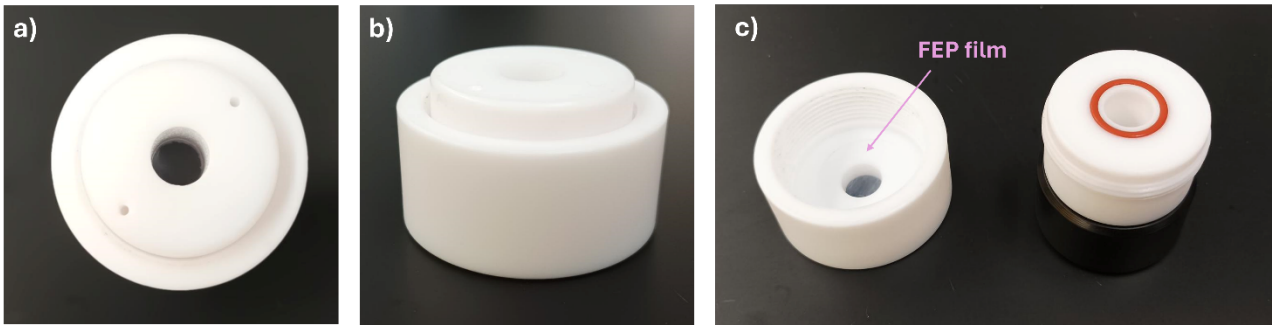
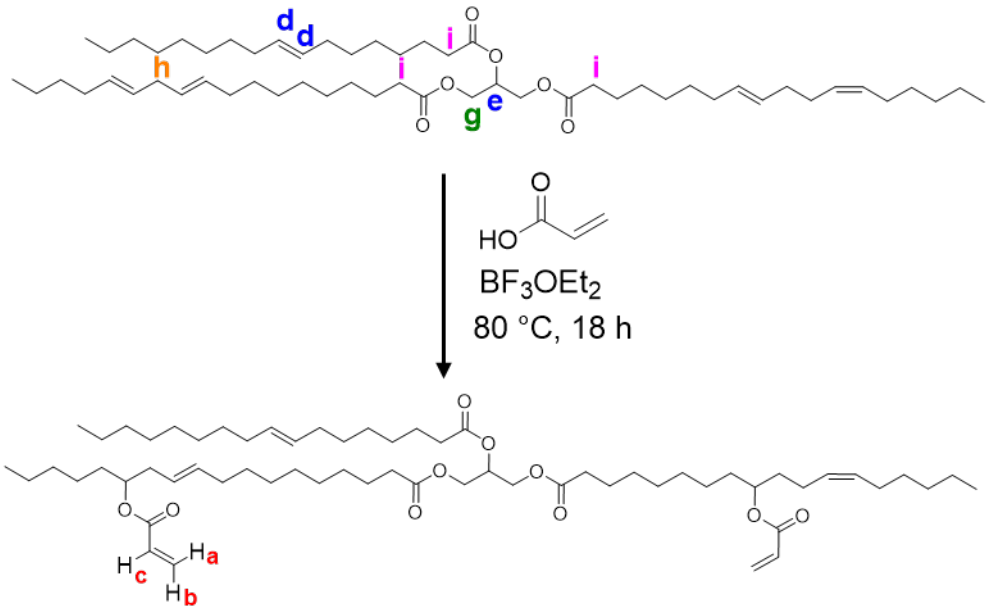
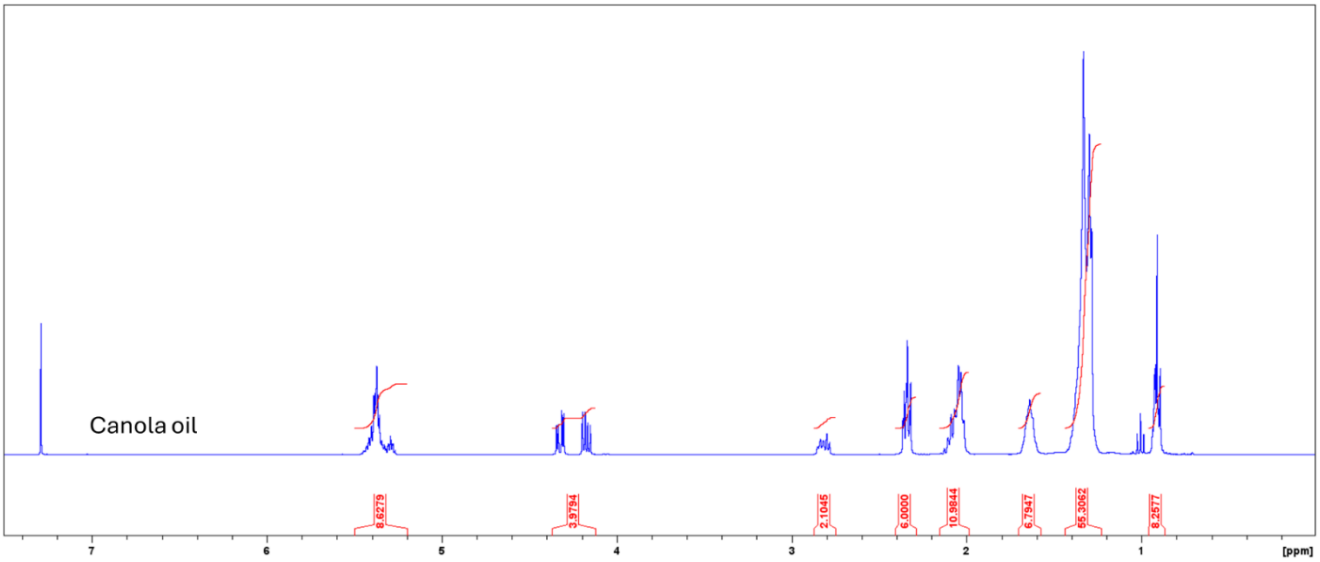


Figure S1. Homemade apparatus used for Jacobs curve measurements: (a) top view, (b) side view, and (c) apparatus separated into two parts.





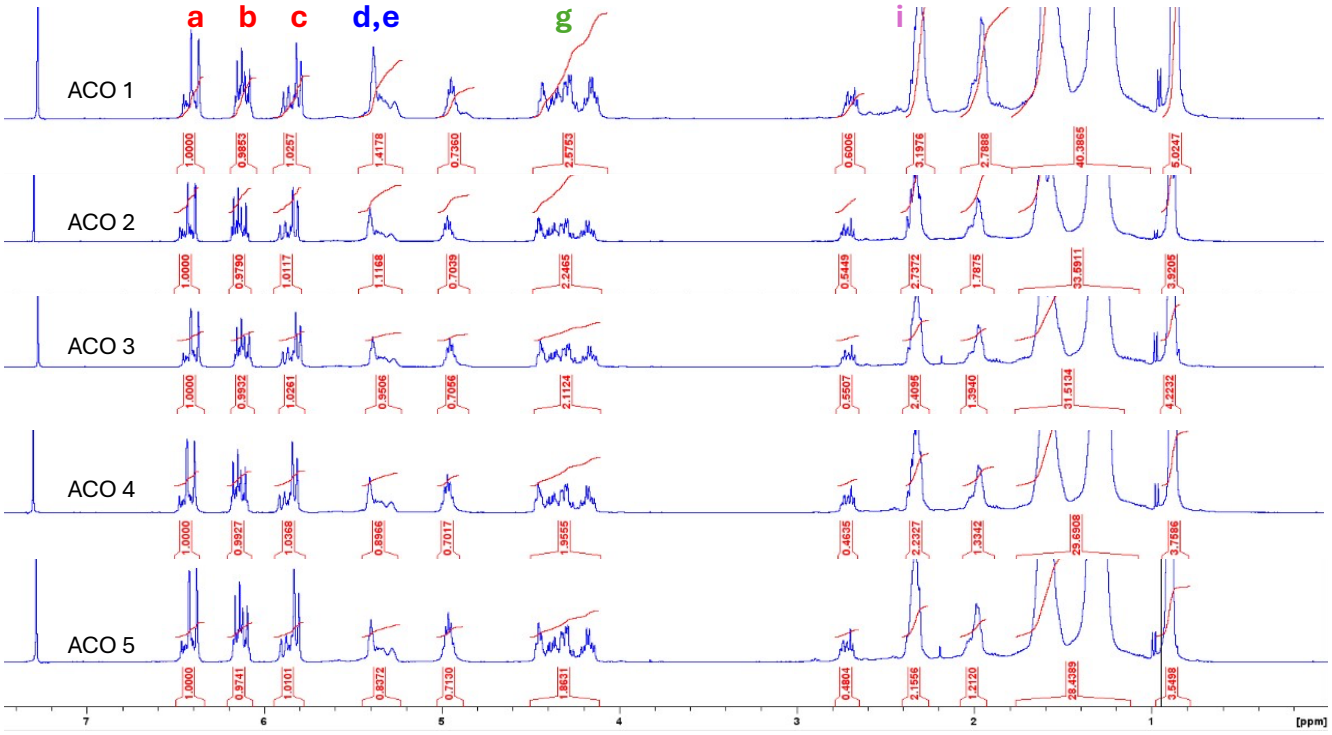


Figure S2. ACO structure and ^{1}H NMR of the canola oil and of ACO1-5

Calculations:

$$\text{Double bonds per oil molecule, } \mathbf{DB} = \frac{[A_{d,e}-(A_g/4)]\,/\,2}{\left(\frac{A_i}{6}\right)} = 3.82$$

$$\text{Average acrylate functionality, } \overline{\mathbf{f}} = \frac{A_a}{A_i/6}$$

$$\text{Conversion} = \frac{\overline{f}}{DB}$$

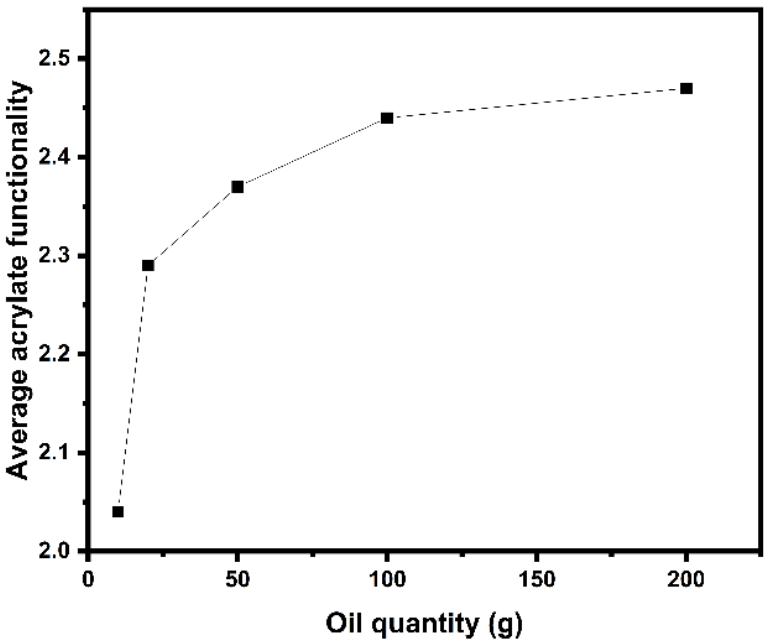
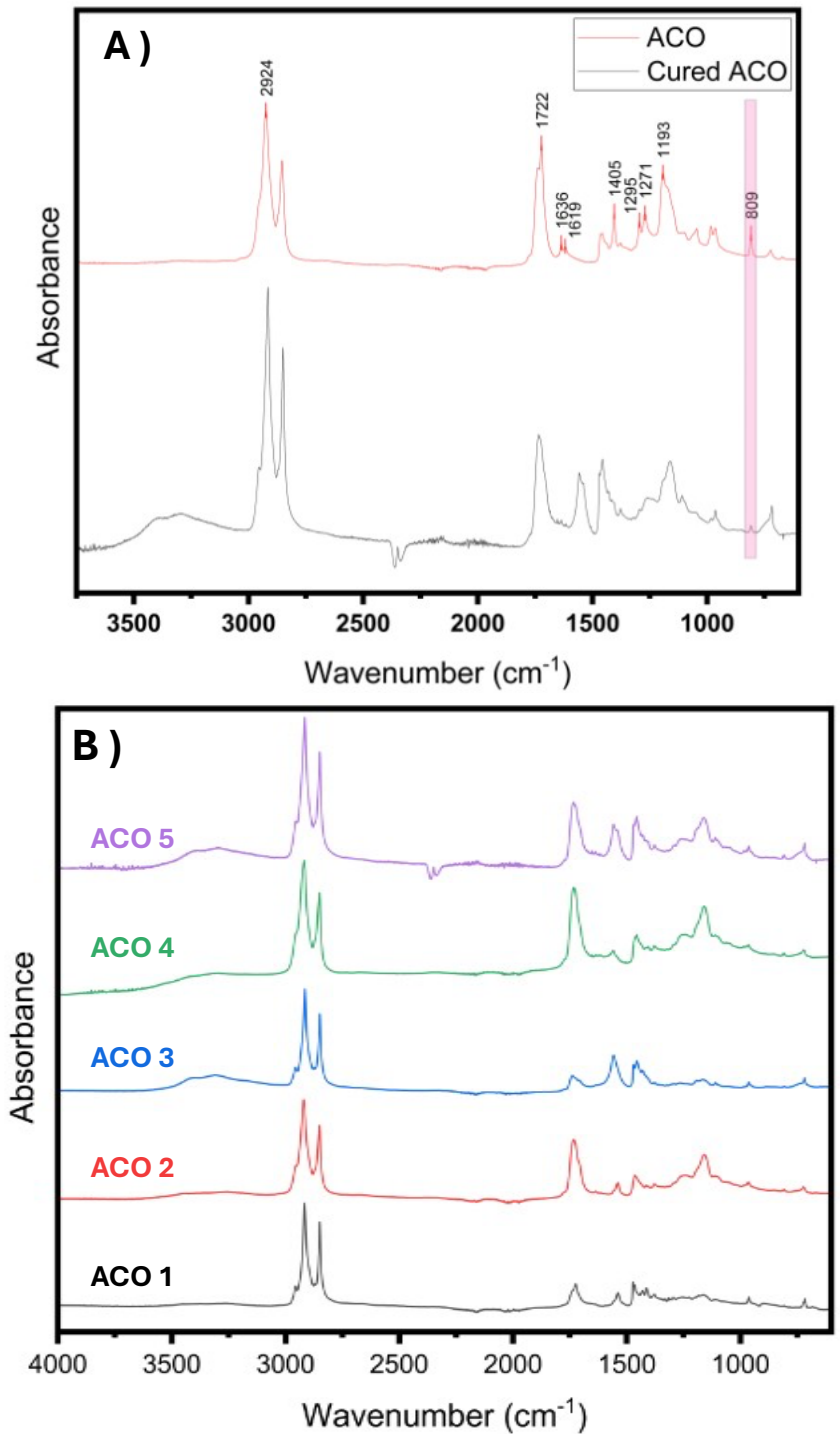


Figure S3. Average acrylate functionality as a function of the oil quantity used in the acrylation reaction. 16 equiv. of acrylic acid were used for all reactions.



	ACO 1	ACO 2	ACO 3	ACO 4	ACO 5
Polymerization conversion (%)	76	82	75	82	73

Figure S4. FTIR spectra of A) Acrylated canola oil (ACO) and Cured ACO and B) ACO1-ACO5 with polymerization conversion.

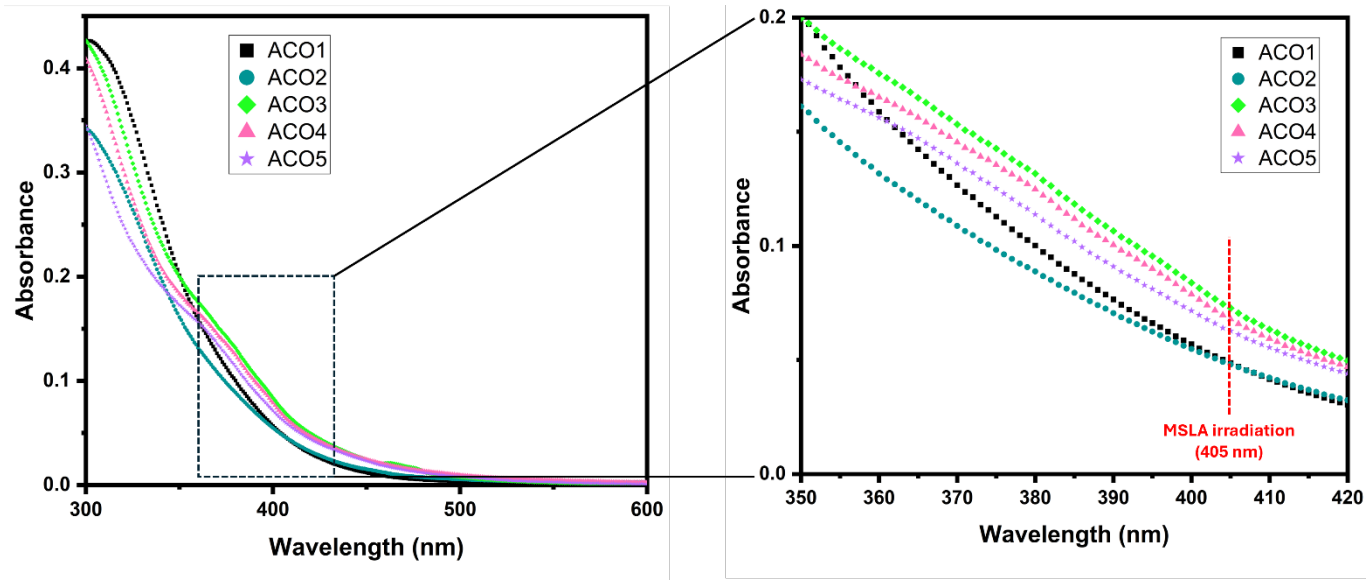


Figure S5. UV-Vis spectra of ACO with varying acrylate functionality.

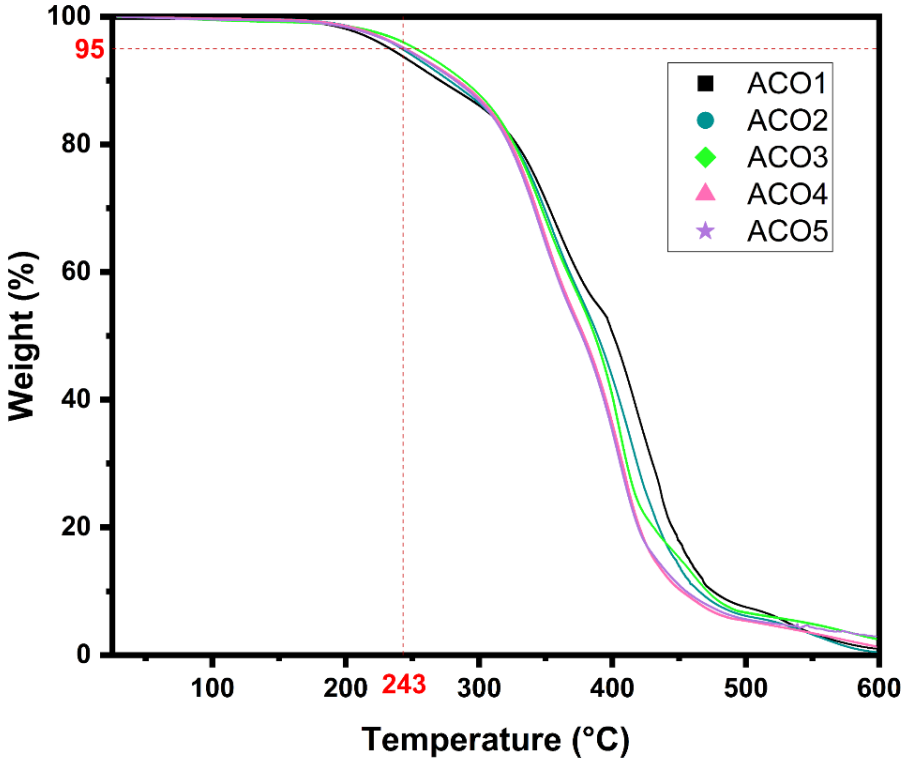


Figure S6. Thermogravimetric analyses of ACO1-5. The degradation temperature was determined at 5 % of weight loss. It was found to be around 243 °C ± 10 °C.

Table S1. Mechanical characterization of ACO1-5

Compounds	Mechanical properties		
	Tensile modulus (MPa)	**Ultimate Tensile Strength (MPa)**	**Elongation at break (%)**
ACO1	9 ± 1	0.26 ± 0.02	4.0 ± 0.3
ACO2	11 ± 2	0.37 ± 0.11	4.0 ± 0.8
ACO3	13 ± 1	0.40 ± 0.05	3.8 ± 0.5
ACO4	17 ± 1	0.52 ± 0.11	4.6 ± 0.5
ACO5	18 ± 1	0.47 ± 0.11	3.1 ± 0.9

Table S2. Decomposition temperatures of ACO1-5 at 5% weight loss.

Compounds	$T_{5\%}$ (°C)
ACO1	233
ACO2	242
ACO3	252
ACO4	245
ACO5	244

Table S3. Glass transition temperature of ACO1-5

Compounds	T_g (°C)
ACO1	-2
ACO2	-1
ACO3	-6
ACO4	-9
ACO5	-7

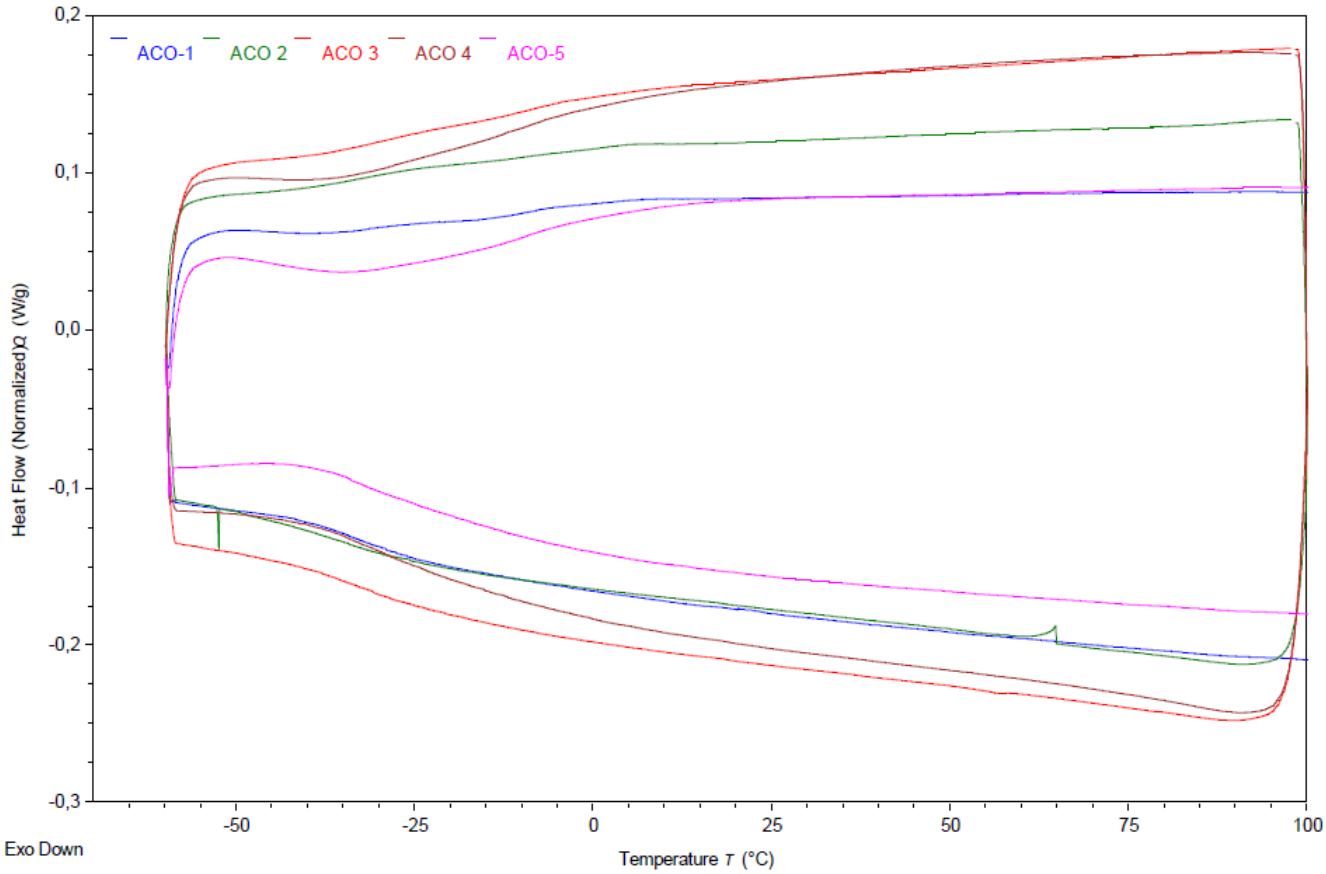
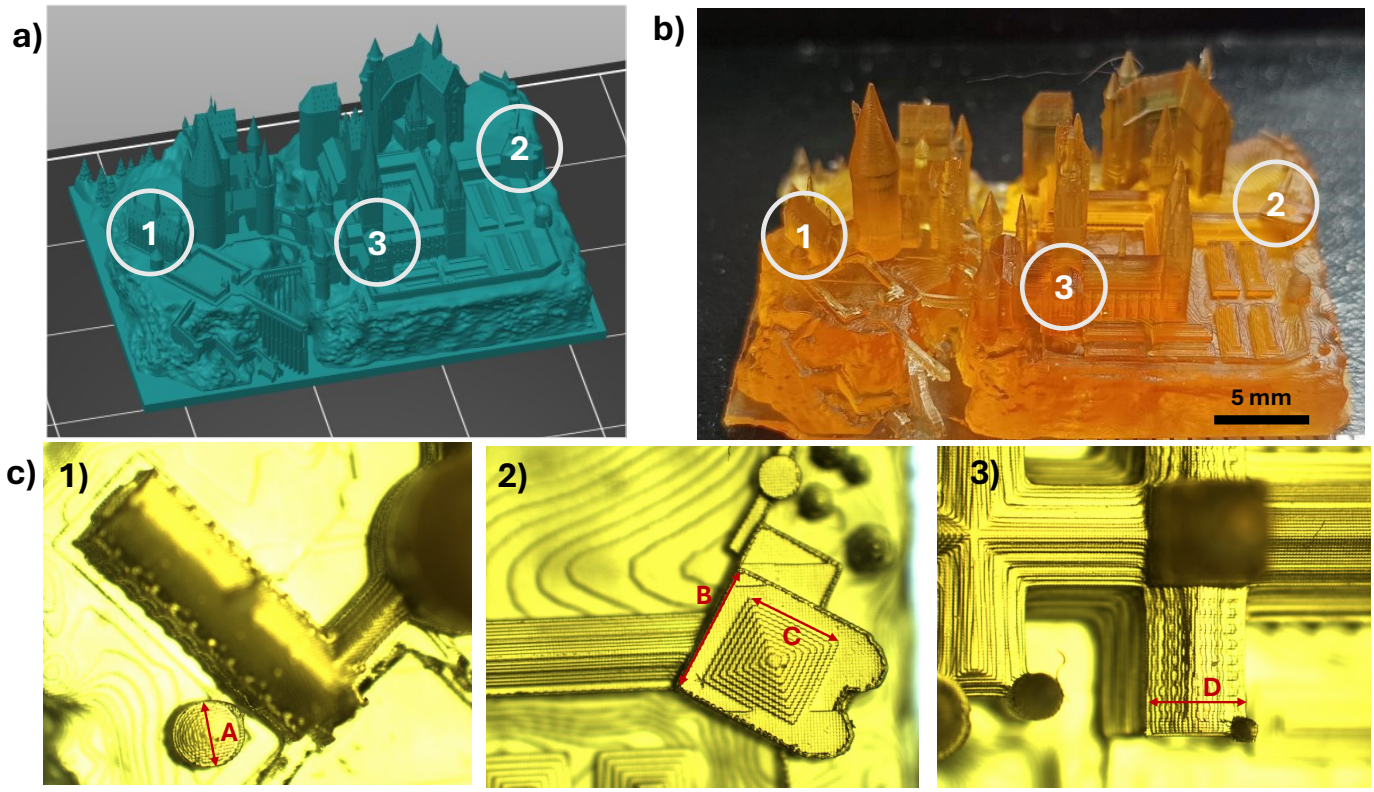


Figure S7. DSC heating and cooling curves for the ACO1-5 compounds.



	Theoretical size (mm)	Measured size (mm)	Dimensional error (%)	Print Fidelity (%)
A	1.094	1.053	3.7	96.3
B	2.115	2.107	0.4	99.6
C	1.623	1.600	1.4	98.6
D	1.597	1.604	0.4	99.6
Mean			1.5	98.5

$$\text{Print fidelity} = \left(1 - \frac{|\text{Theoretical size} - \text{Measured size}|}{\text{Theoretical size}}\right) \times 100$$

Figure S8. Print fidelity measurements of the printed Hogwarts castle. a) Castle 3D Model b) Printed object c) Optical microscopy images of different part of the castle.