

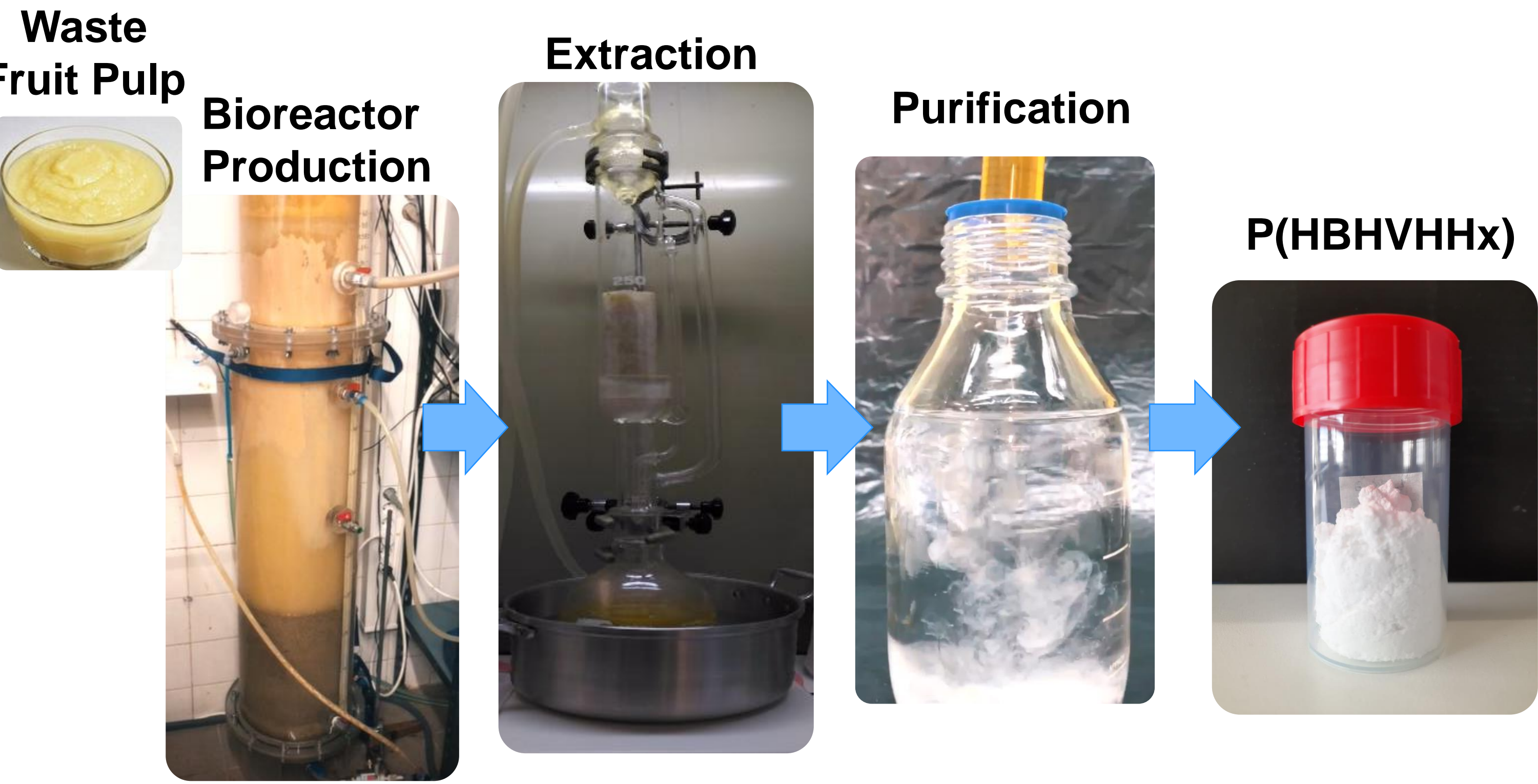
Introduction

Polyhydroxyalkanoates (PHAs) are polyesters accumulated intracellularly as carbon and energy storage compounds by many bacteria. These biopolymers can have very distinct properties, ranging from hard and brittle materials to soft and flexible elastomers. Due to their mechanical and thermal properties, these biodegradable and biocompatible biopolymers are great candidates for the development of new bio-based products for a wide range of applications in many areas ranging from packaging to high-value medical uses.

In this study, a terpolyester composed of 3-hydroxybutyrate, 3-hydroxyvalerate and 3-hydroxyhexanoate monomers, P(HBHVHHx)), extracted from a mixed microbial consortium (MMC) biomass, was used to fabricate porous scaffolds by emulsion-templating. The resulting biopolymeric structures were seeded with neonatal human dermal fibroblasts (HDFn) to evaluate their ability to support cell proliferation and migration, envisaging their use for cell culture.

Results

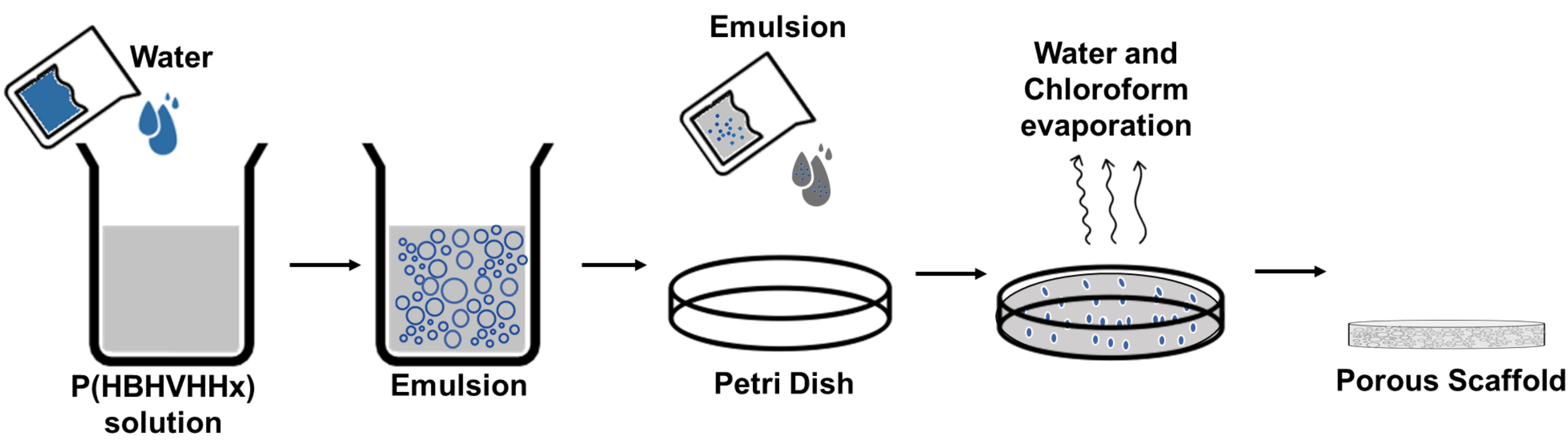
Biopolymer Production



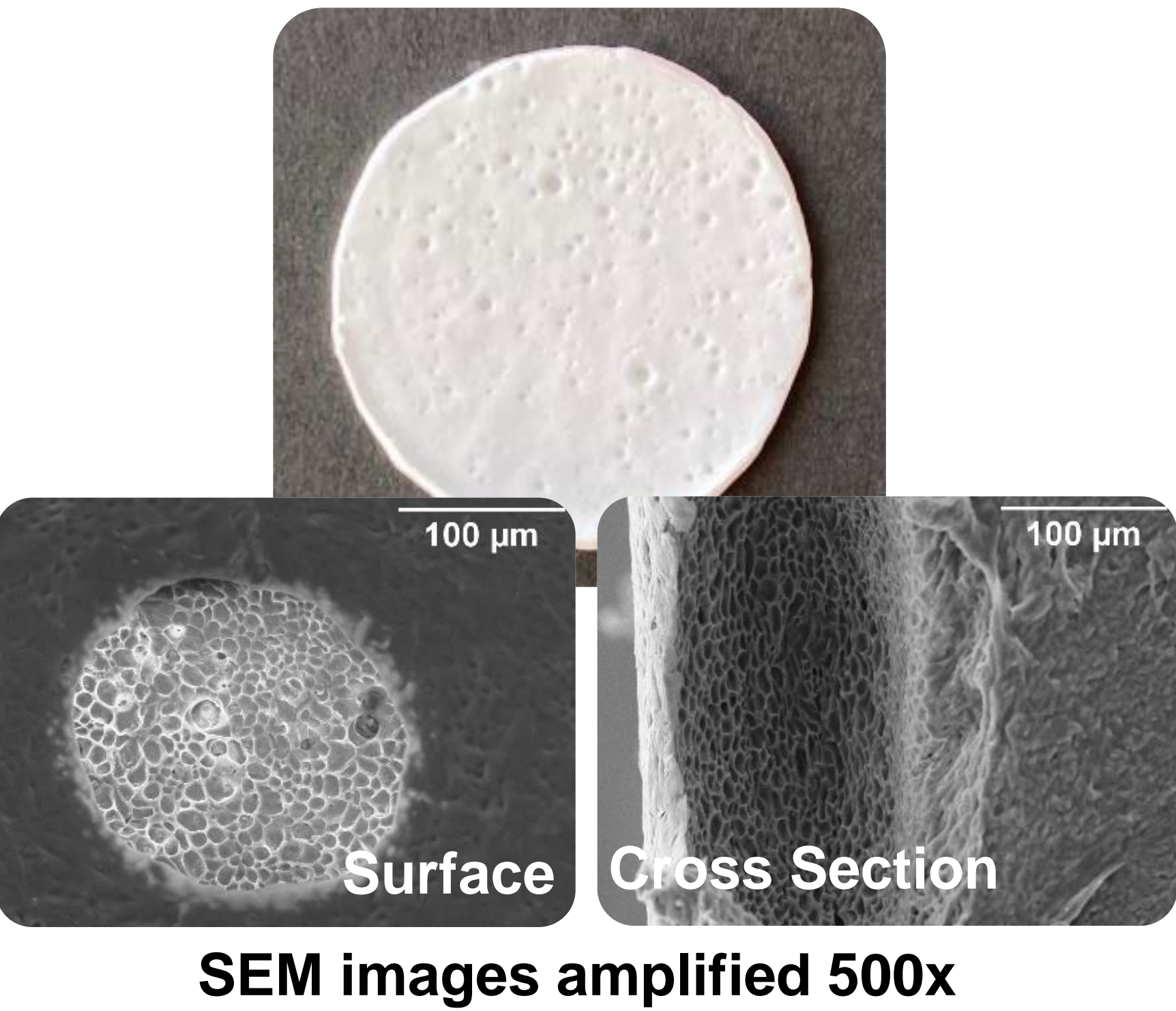
Biopolymer Characterization

Biopolymer	Composition (%WT)			ΔH_m (J/g)	T_m (°C)	T_g (°C)	T_{deg} (°C)	X_c (%)
	3HB	3HV	3HHx					
P(HBHVHHx)	68,7	24,5	6,8	4.3	145	-2.6	267	26

Scaffold Preparation



P(HBHVHHx) Scaffold Characterization

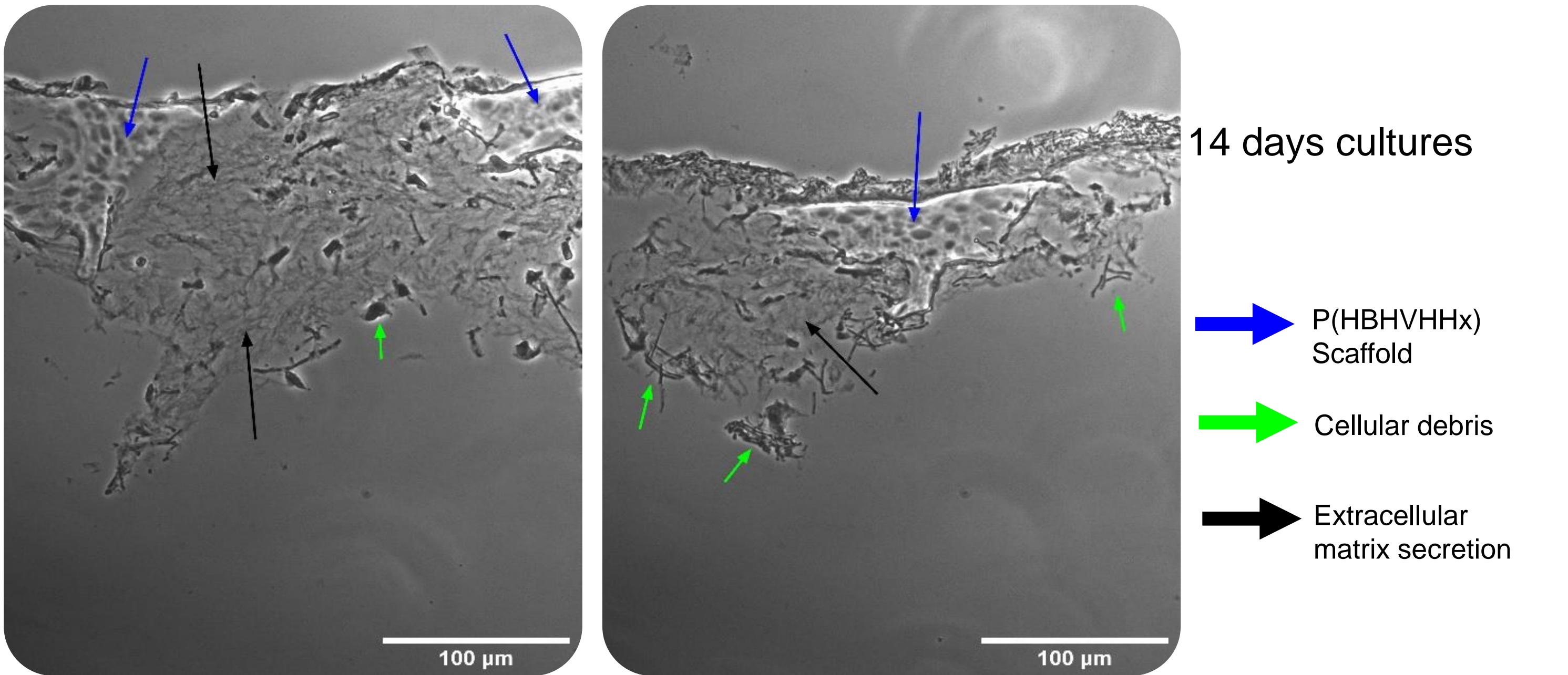
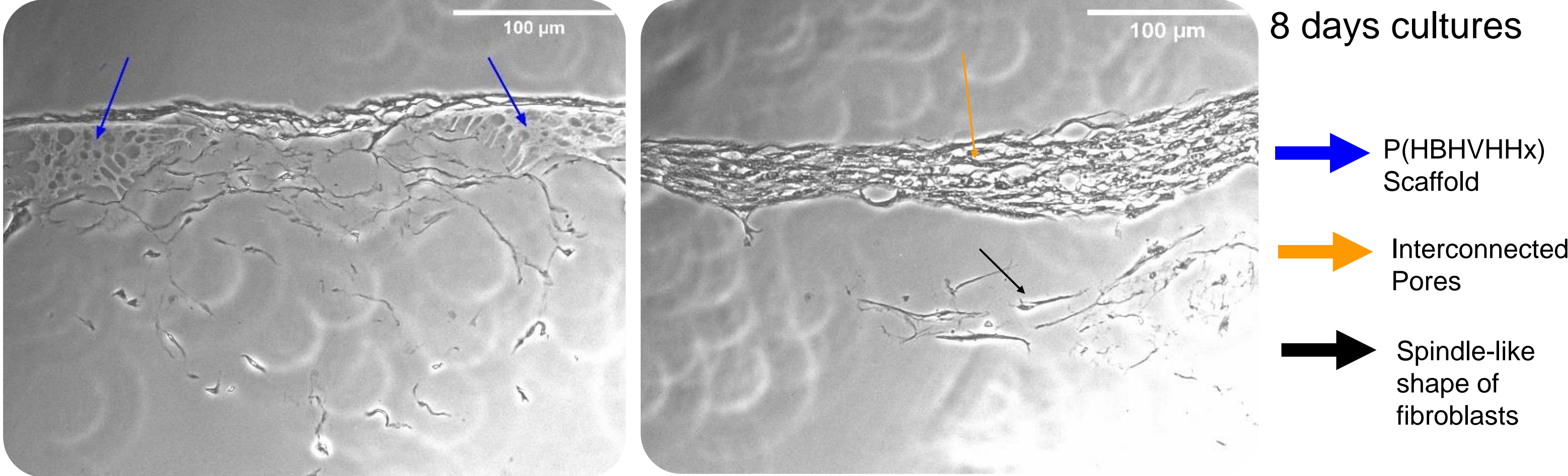


Material	Processing	Young Modulus (MPa)	Tensile strength (MPa)	Elongation at break (%)	Reference
P(HBHVHHx)	Water emulsion	0.6	3.6	56	This study
Collagen/Fibrin	Oil-in-water emulsion	1 - 2	12 - 16	n.a	Lim et al., 2018
Fibrin	Oil-in-water emulsion	1 - 2	4 - 5	n.a	Lim et al., 2018
Silk fibroin	Oil-in-water emulsion/freezing	0.23 – 0.36	n.a	n.a	Wen et al., 2018



Dermal Constructs with porous scaffolds of P(HBHVHHx)

Microscope images



Conclusions

In this work, the biopolymer P(HBHVHHx) produced by MMC from fermented waste fruit pulp was used to fabricate porous scaffolds. The porous scaffolds, were able to sustain the migration and proliferation of HDFn. These promising

results sustain the utilization of PHAs for the development of new bio-based biomaterials for medical applications, contributing, at the same time, to an environmental sustainability and promoting a circular economy.

References

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- J. Wen, J. Yao, X. Chen, Z. Shao, ACS Omega, **3**(3), 3396–3405 (2018)

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