

SYNTHETIC BIO-INSPIRED LIPID COATINGS FOR BLOOD SUBSTITUTES

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BLOOD SCARCITY

SUPPLY-DEMAND AT THIN EQUILIBRIUM

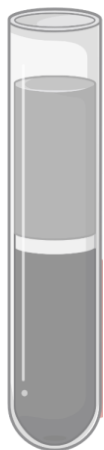


- Low frequency voluntary blood donations
- Strict eligibility criteria for blood donors
- Aging population
- War, natural disasters, pandemics
- Short storage times of blood supplies

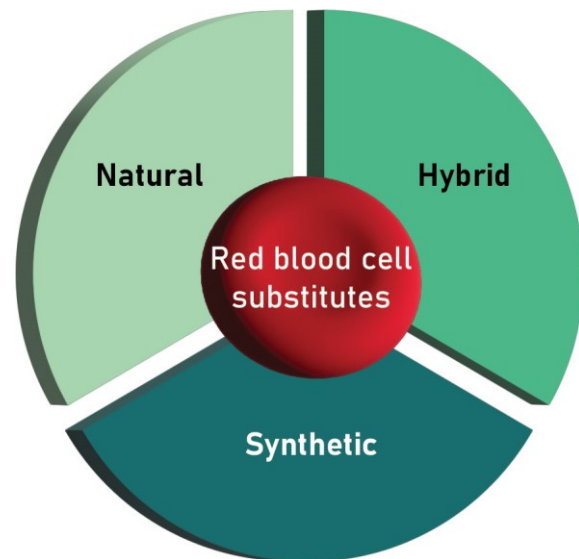
▶ Need for blood substitutes

BLOOD SUBSTITUTES

RECREATING RED BLOOD CELL FUNCTION



Red blood cells



Natural

	Myosin IIb	F-actin	Merge
Adult			
Stem cell-derived			

Nat Commun 8, 14750 (2017)

Hybrid

ACS Nano 16, 4, 6527-6540 (2022)

Synthetic

Elastomer-shell:

Soft segment | Hard segment

CC(=O)OCCOC(=O)C

Poly(lactide-co-caprolactone) (PLC)

Stretch

Deformability

PFC-core:

Concave shape

BrC(F)(F)F

Perfluorooctyl bromide (PFOB)

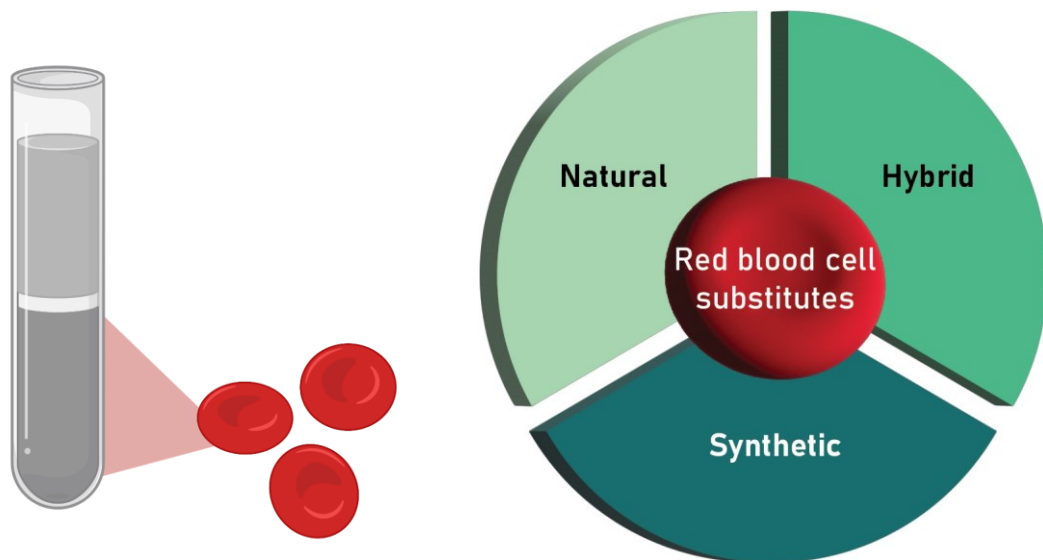
Oxygen dissolution

Microchannel arrays

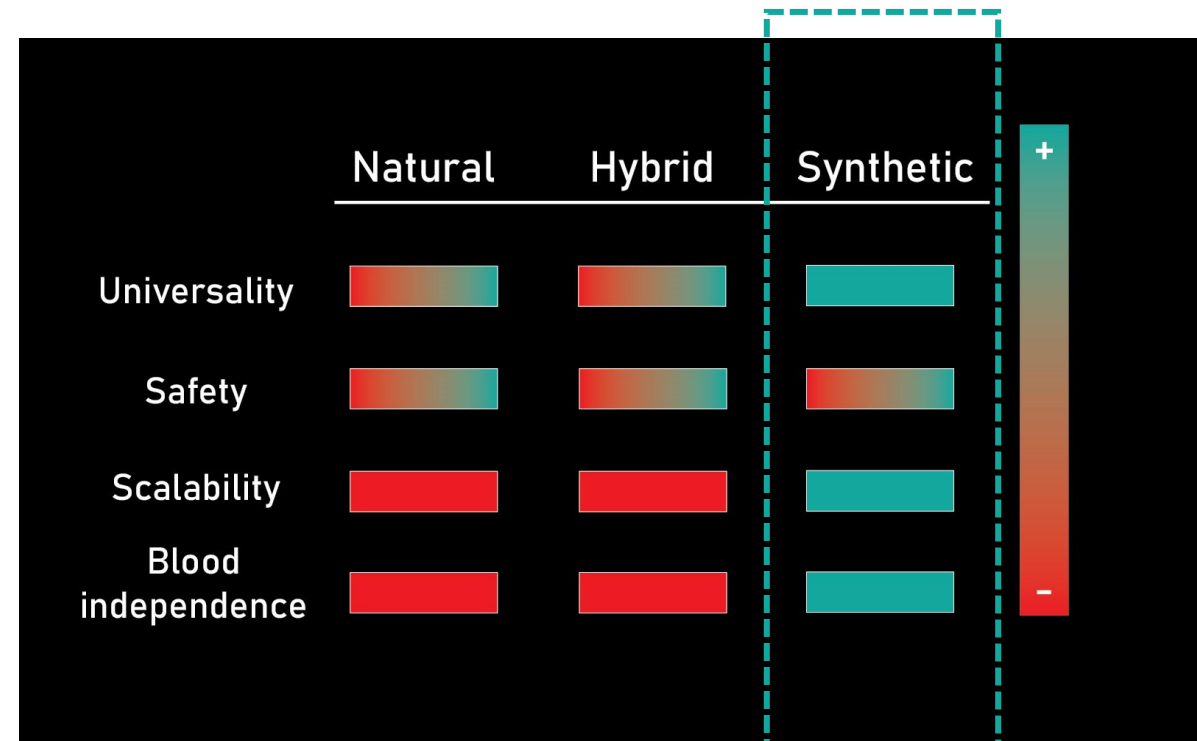
Adv. Mater. Technol. 7, 2100573 (2022)

BLOOD SUBSTITUTES

RECREATING RED BLOOD CELL FUNCTION

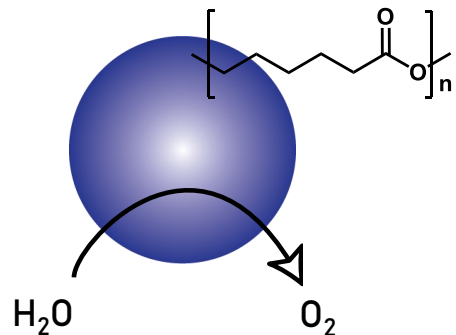


Red blood cells



SELF-OXYGENATING MICROPARTICLES

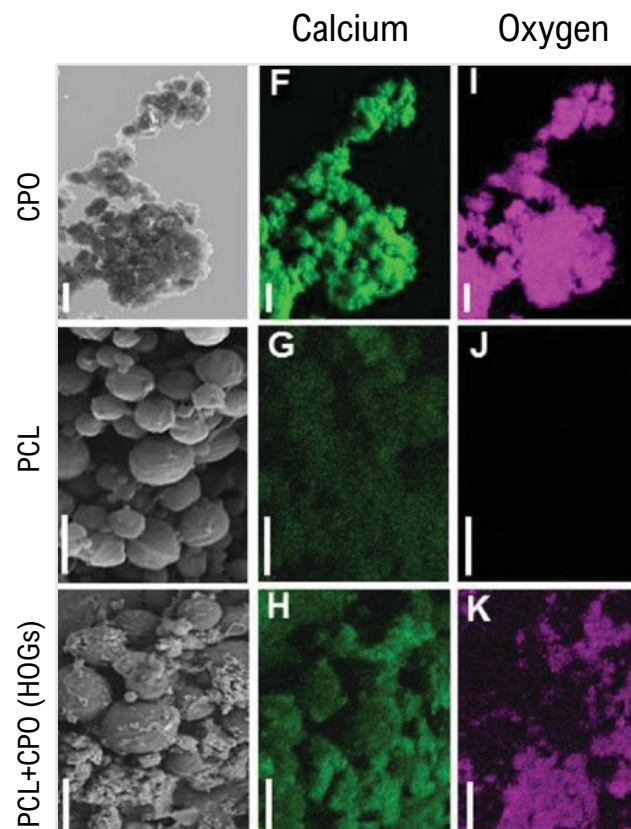
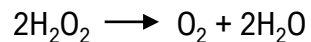
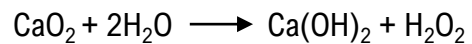
POTENTIAL SYNTHETIC RED BLOOD CELLS



Matrix: Polycaprolactone (PCL)

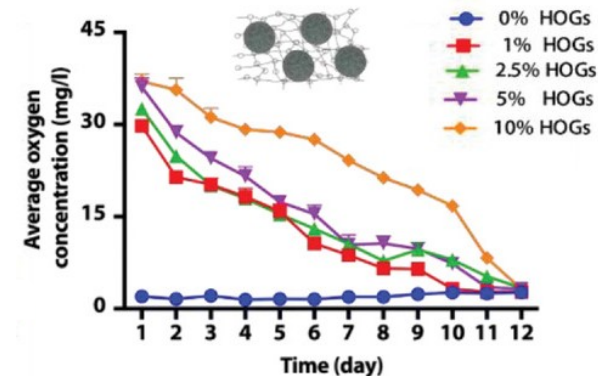
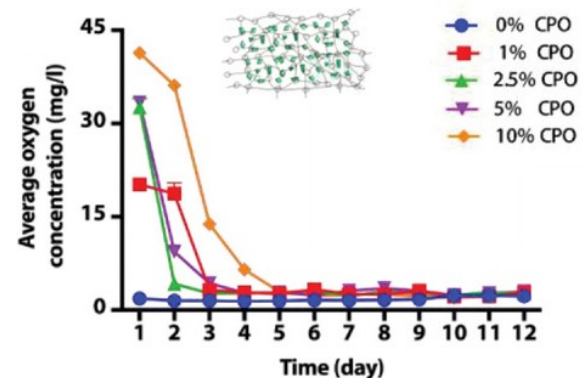
Core: CaO₂ crystals (CPO)

Self-oxygenation action:



Scale bar 4 μm

Controlled oxygen release



▶ PCL offers excellent slow oxygen release, but its blood compatibility is low

▶ Need for coatings to improve blood compatibility

- The slides 6-9 have been deleted, because of unpublished data

OUTLOOK

- ▶ Red blood cell membrane-mimicking lipid coatings were created
- ▶ Ongoing production of different lipid-coated, oxygen-generating constructs for **red blood cell** and **tissue engineering**

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LSHM19074: Synthetic Red Blood Cells for
Safe Intravenous Injection

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