Electronic Supplementary Material (ESI) for Materials Advances.

Development of rapid hypoxia-detectable artificial oxygen carriers with core-shell structure and erythrocyte mimetic shape

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Name	Value	Unit	Source
Radius of core, $\boldsymbol{R_1}$	2	μm	Specified
Shell thickness, $\boldsymbol{R_2}$	2	μm	Specified
O_2 Diffusivity in the PFOB core, $\boldsymbol{D_1}$	5.6×10^{-5}	cm^2/s	[1]
O_2 Diffusivity in the PDMS shell, $\boldsymbol{D_2}$	3.4×10^{-5}	cm^2/s	[2]
O_2 Diffusivity in culture medium, $\boldsymbol{D_3}$	2.4×10^{-5}	cm^2/s	[3]
O_2 Solubility in PFOB (1 atm), $\boldsymbol{S_1}$	21135	μM	[1]
O_2 Solubility in PDMS (1 atm), $\boldsymbol{S_2}$	8035	μM	[4]
O_2 Solubility in culture medium (1 atm), $\boldsymbol{S_3}$	1056	μM	[5]
Temperature, $\boldsymbol{T}$	37	℃	Specified
Pressure, $\boldsymbol{P}$	1	atm	Specified

Table. S1 Parameters used in the simulation of oxygen transfer within cDFC

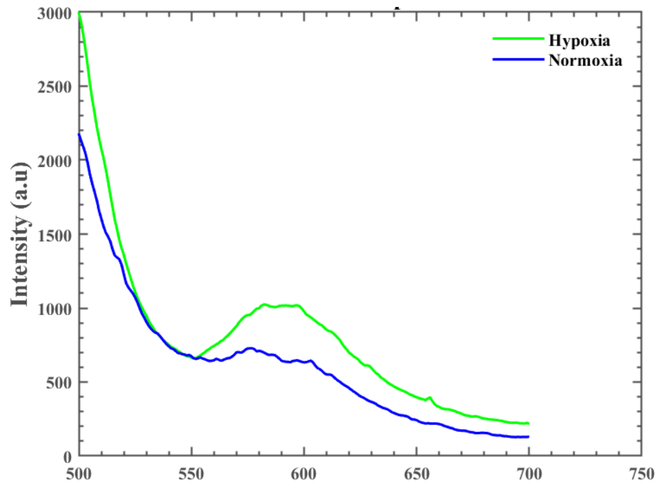

Fig. S1 Phosphorescence response intensity map of Ru(dpp)@ PFOB/PDMS–TPE; Blue: normoxia (20% O_2), Green: hypoxia (0% O_2)

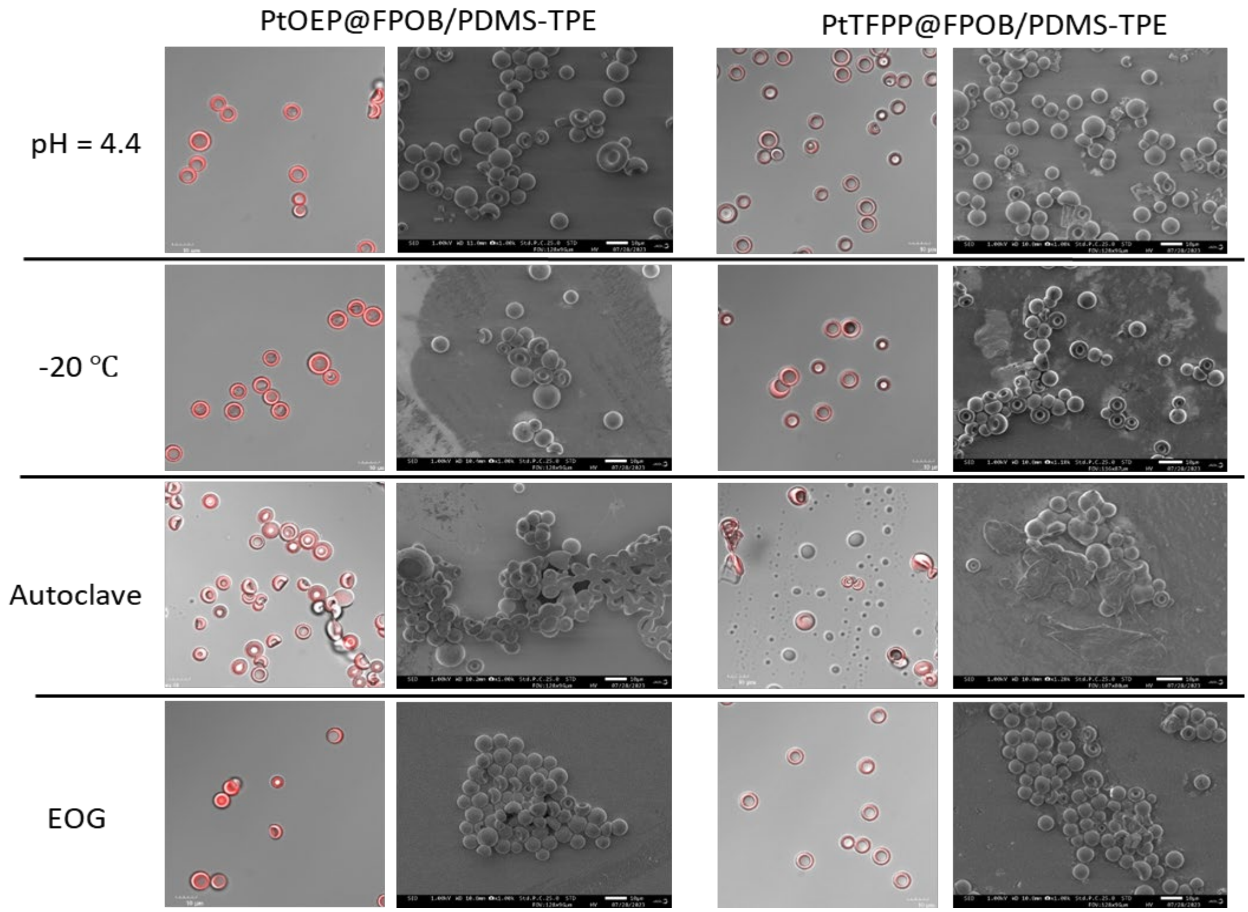

Fig. S2. Confocal and SEM images of bifunctional cDFCs after treatments such as low pH (pH=4.4) inculation, low temperature (-20℃) incubation, autoclave, and EOG sterilization; Scale bar = 10 μm

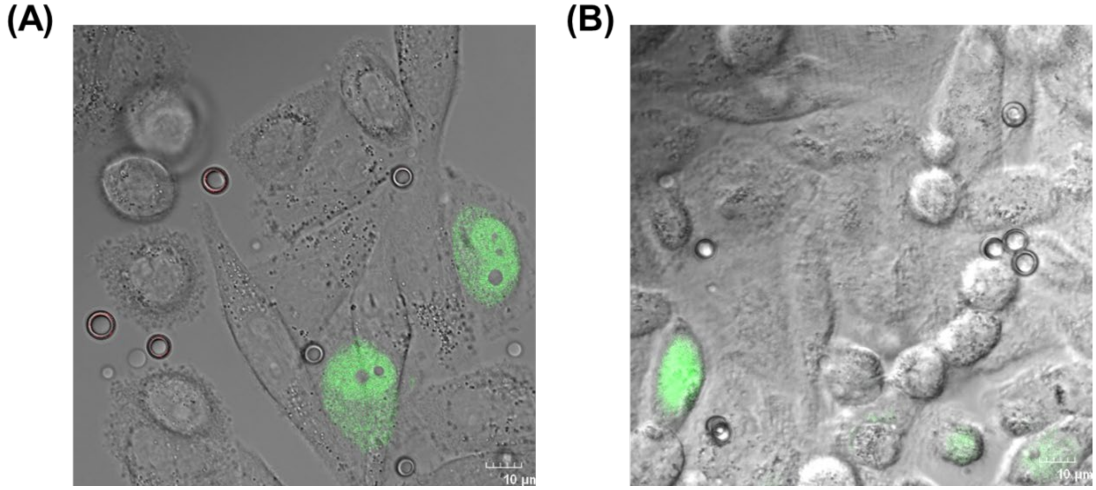

Fig. S3 Merged channels confocal images of bifunctional cDFCs dispersed with Hr-HeLa cells under normoxia condition; (A) PtOEP@PFOB/PDMS–TPE; (B): PtTFPP@PFOB/PDMS–TPE; Green channel: ex = 488 nm;

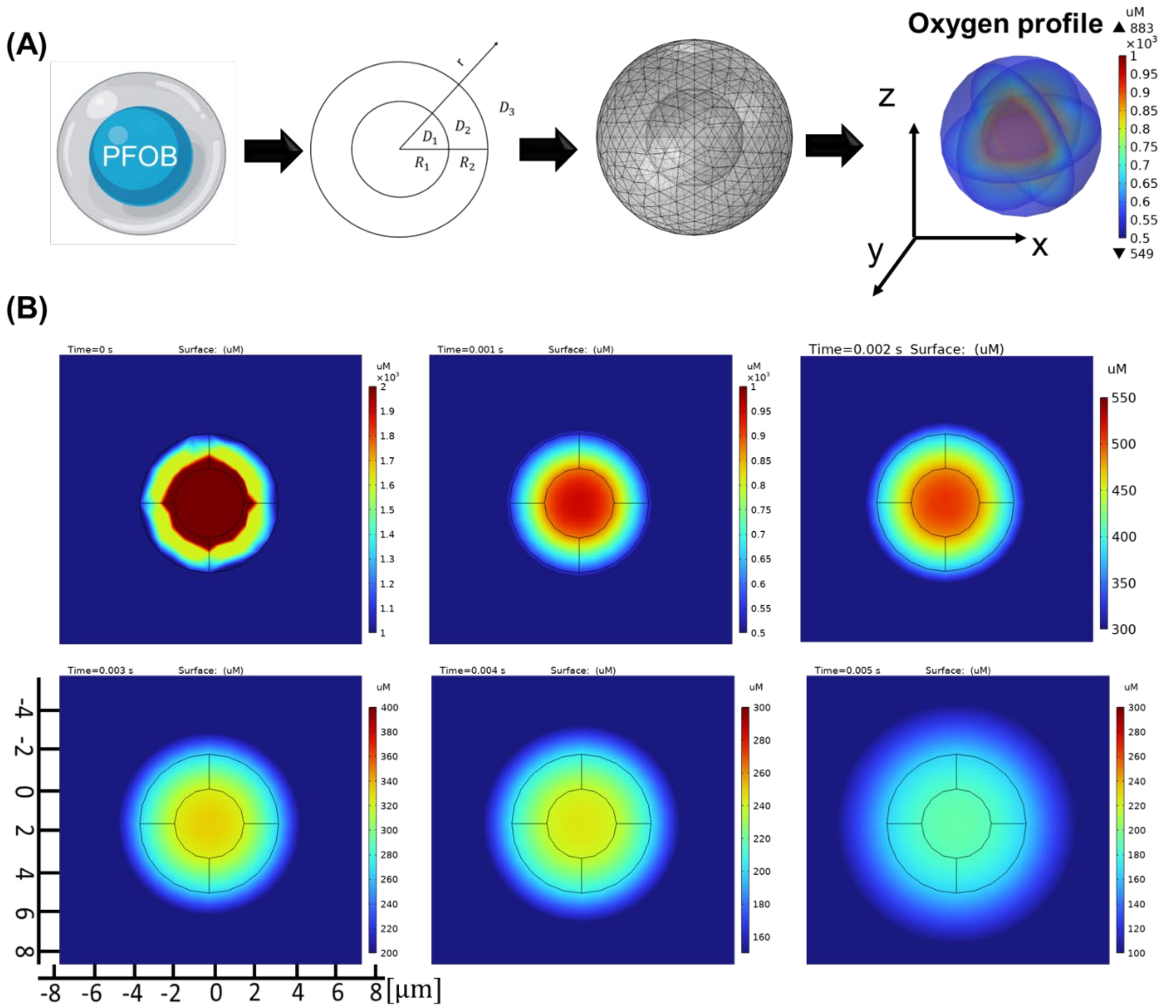

Fig. S4 Simulation of oxygen release from the PFOB/PDMS–TPE spherical microparticle

(A) Built-up of spherical core-shell particle model, R_1 represents for the radius of PFOB core, R_2 represents for the shell thickness; D_1, D_2, and D_3 represent the oxygen diffusivity in PFOB, PDMS–TPE, and culture medium, respectively;

(B) Simulated results of 2D oxygen diffusion profile from 0 ms to 5 ms

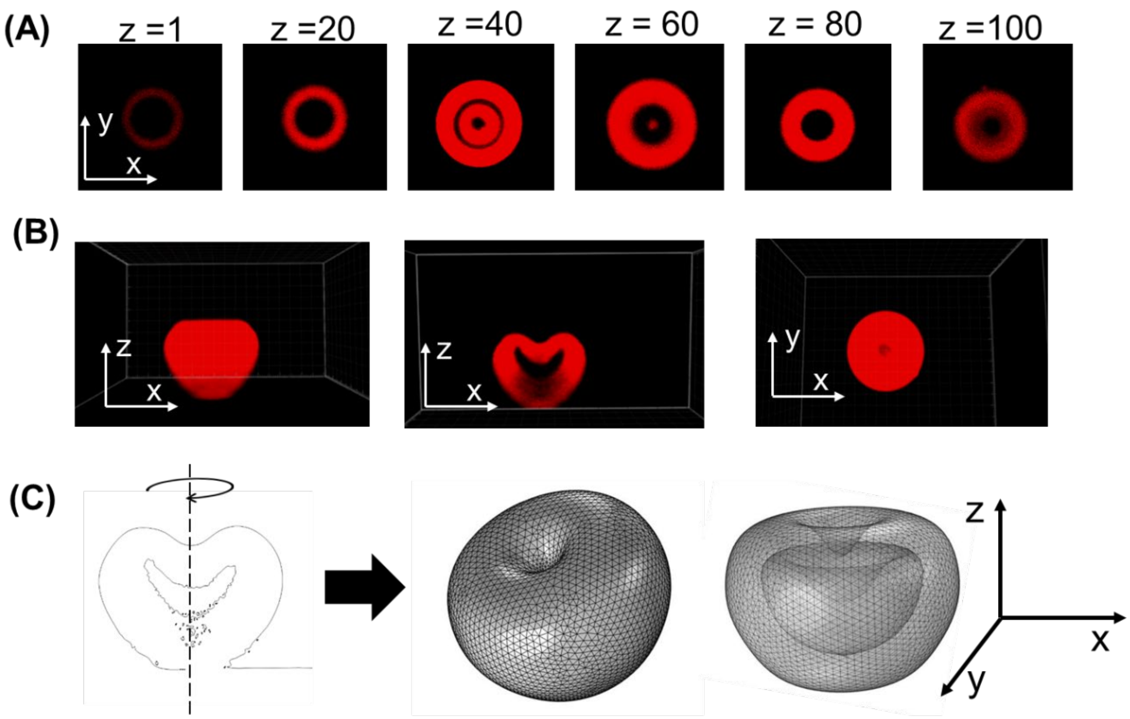

Fig. S5. Construction of cDFC 3D model by importing 2D confocal image stacks into COMSOL by using Imaris. (A) Selected confocal images of a cDFC at different z positions; (B) Reconstrcutred 3D confocal image of cDFC by Imaris. Left: Front view. Middle: Cross-section of front Right: Top view; (C) Import of cDFC cross-section into COMSOL and output the 3D gemomerty Overview of 3D mesh cDFC geometry in COMSOL. Left: 2D imported contour from Imaris image. Right: overview and transparent view of cDFC 3D mesh after revolution;

Fig. S6. Movie (GIF) of the hypoxia response of suspension containing 1 vol% of PtOEP@PDMS–TPE in water after the addition of Na_2SO_3. Phosphorescence rapidly appeared with UV irradiation at 365 nm after the addition of Na_2SO_3.

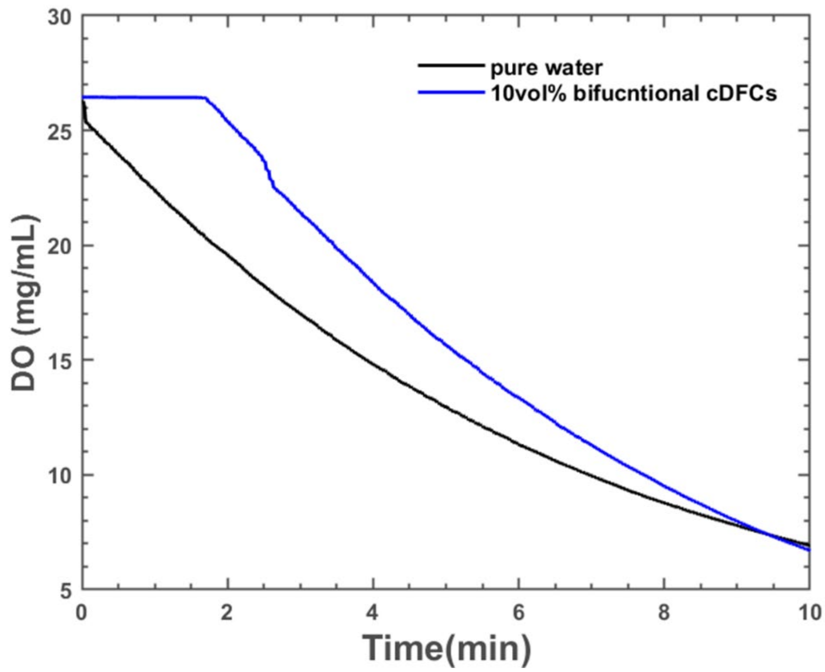

Fig. S7. Oxygen releasing curves of water (black) and 10 vol% bifunctional cDFC suspension (blue). The suspension was first perfused with pure oxygen at 100 mL/min until the saturated. Then nitrogen gas was perfused into the suspension at the same speed. The dissolved oxygen (DO) concentration decrease was monitored by a DO meter at real time.

Reference

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