

Supporting Information

Implantable, 3D-Printed Alginate Scaffolds with Bismuth Sulfide Nanoparticles for the Treatment of Local Breast Cancer via Enhanced Radiotherapy

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Supporting Figures

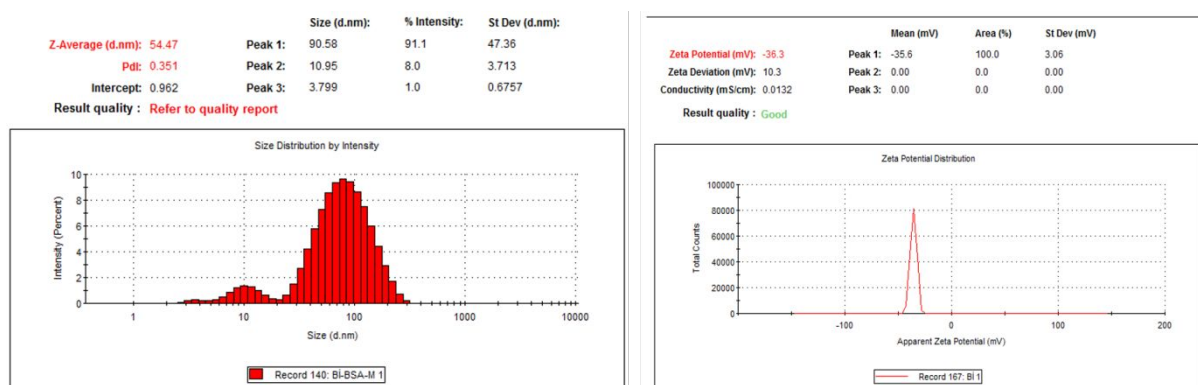


Figure S1. DLS analysis of Bi₂S₃@BSA nanoparticles.

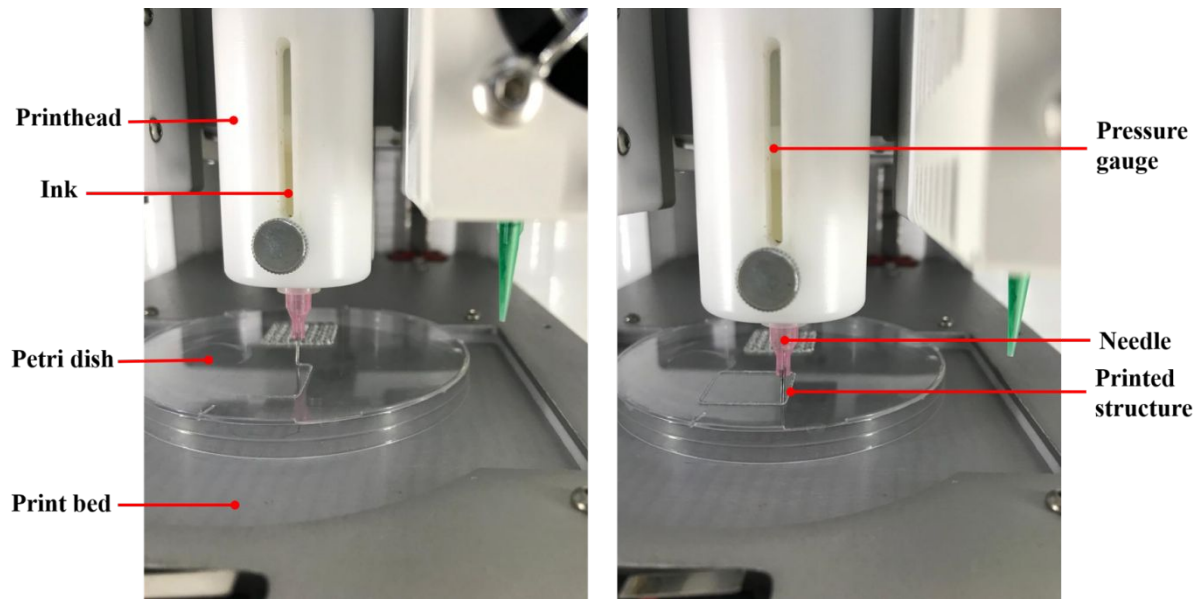


Figure S2. Components of the Axo A3 Bioprinting device.

Table S1. 3D printing parameters of the four different hydrogels.

Conditions	Alginate (Alg)	Alg- Bi₂S₃@BSA (0.25%)	Alg- Bi₂S₃@BSA (0.5%)	Alg- Bi₂S₃@BSA (1%)
Needle size (G)	25 G	25 G	25 G	25 G
Pressure (kPa)	4.1	5.1	5.8	6.1
Speed (mm/s)	100	100	100	100
Density	40%	40%	40%	40%
Print-head temperature (°C)	-	-	-	-
Print-bed temperature (°C)	4	4	4	4

a

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	A	F
C K	13.75	17.69	172.90	12.94	0.0646	1.0431	0.4500	1.0000
N K	0.02	0.03	0.30	99.99	0.0001	1.0186	0.3057	1.0000
O K	85.12	82.20	2976.10	6.76	0.4480	0.9974	0.5277	1.0000
BiM	1.11	0.08	26.50	7.32	0.0088	0.5851	1.3634	0.9959

b

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	A	F
C K	23.32	29.68	65.80	7.30	0.1185	1.0462	0.4857	1.0000
N K	0.00	0.00	0.00	99.99	0.0000	1.0219	0.2074	1.0000
O K	73.35	70.08	370.40	7.59	0.2690	1.0008	0.3665	1.0000
BiM	3.33	0.24	16.60	4.87	0.0267	0.5878	1.3675	0.9964

c

Element	Weight %	Atomic %	Net Int.	Error %	Kratio	Z	A	F
C K	23.98	30.50	65.30	7.28	0.1226	1.0464	0.4884	1.0000
N K	0.00	0.00	0.00	99.99	0.0000	1.0221	0.2028	1.0000
O K	72.53	69.25	344.00	7.68	0.2603	1.0010	0.3584	1.0000
BiM	3.48	0.25	16.70	4.88	0.0279	0.5880	1.3678	0.9965

Figure S3. The data of main elements (C, N, O and Bi) amount in the scaffolds. (a) Alg-Bi₂S₃@BSA (0.25%), (b) Alg-Bi₂S₃@BSA (0.5%), (c) Alg-Bi₂S₃@BSA (1%).

Table S2. *In vitro* degradation groups.

Scaffold Type	Medium	pH	Temperature
Alginate (Alg)	PBS (1 ml)	7.4	37 °C
Alg-Bi₂S₃@BSA (0.25%)	PBS (1 ml)	7.4	37 °C
Alg-Bi₂S₃@BSA (0.5%)	PBS (1 ml)	7.4	37 °C
Alg-Bi₂S₃@BSA (1%)	PBS (1 ml)	7.4	37 °C

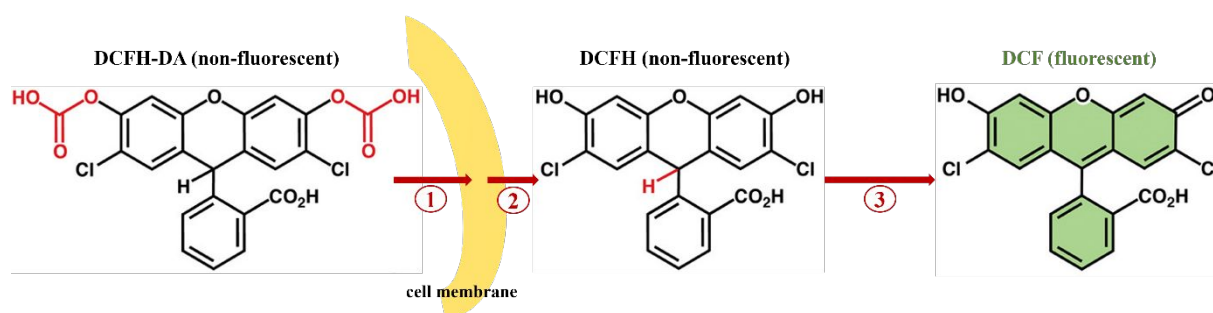


Figure S4. DCFH-DA is taken up by cells (1) where cellular esterase cleaves off the acetyl groups, resulting in DCFH (2). Oxidation of DCFH by ROS (such as $^1\text{O}_2$, H_2O_2 , $\text{OH}\cdot$) converts the molecule to DCF (3), which emits green fluorescence at an excitation wavelength of 485 nm and an emission wavelength of 530 nm.