Electronic Supplementary Material (ESI) for Lab on a Chip.

Electronic Supplementary Information

Biomimetic Spinning of Silk Fibers and *in situ* Cell Encapsulation

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Fig. S1-S6
Table S1-S2

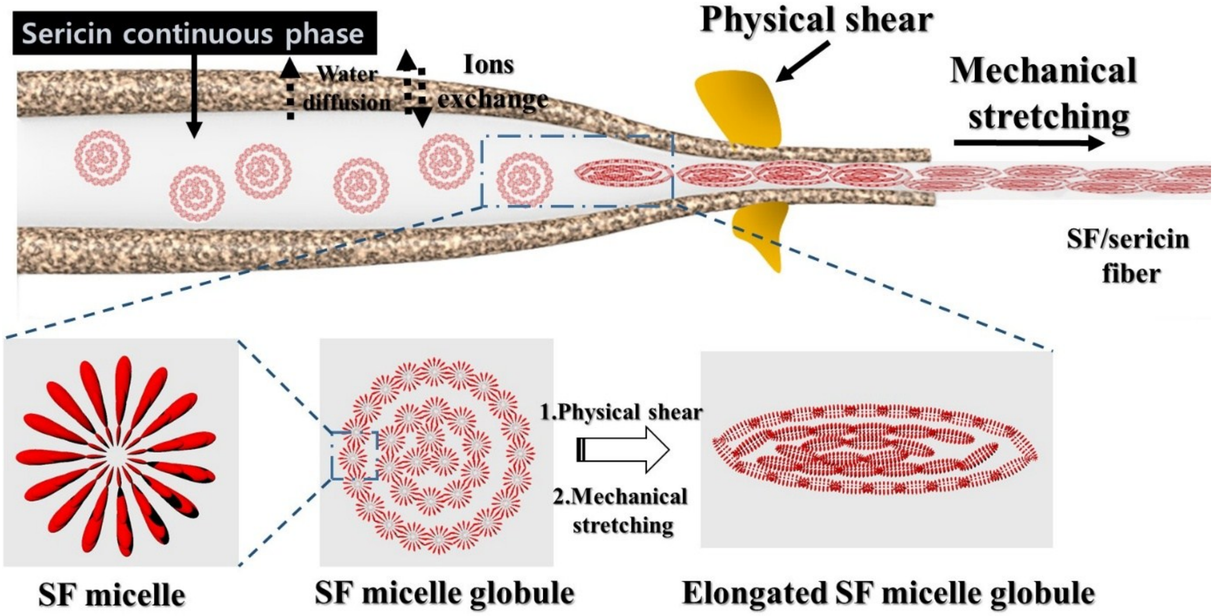

Fig. S1 Natural spinning process inside a *B. mori* duct. SF micelle globules were elongated and entangled each other under the combined action of the physical shearing force and mechanical stretching.

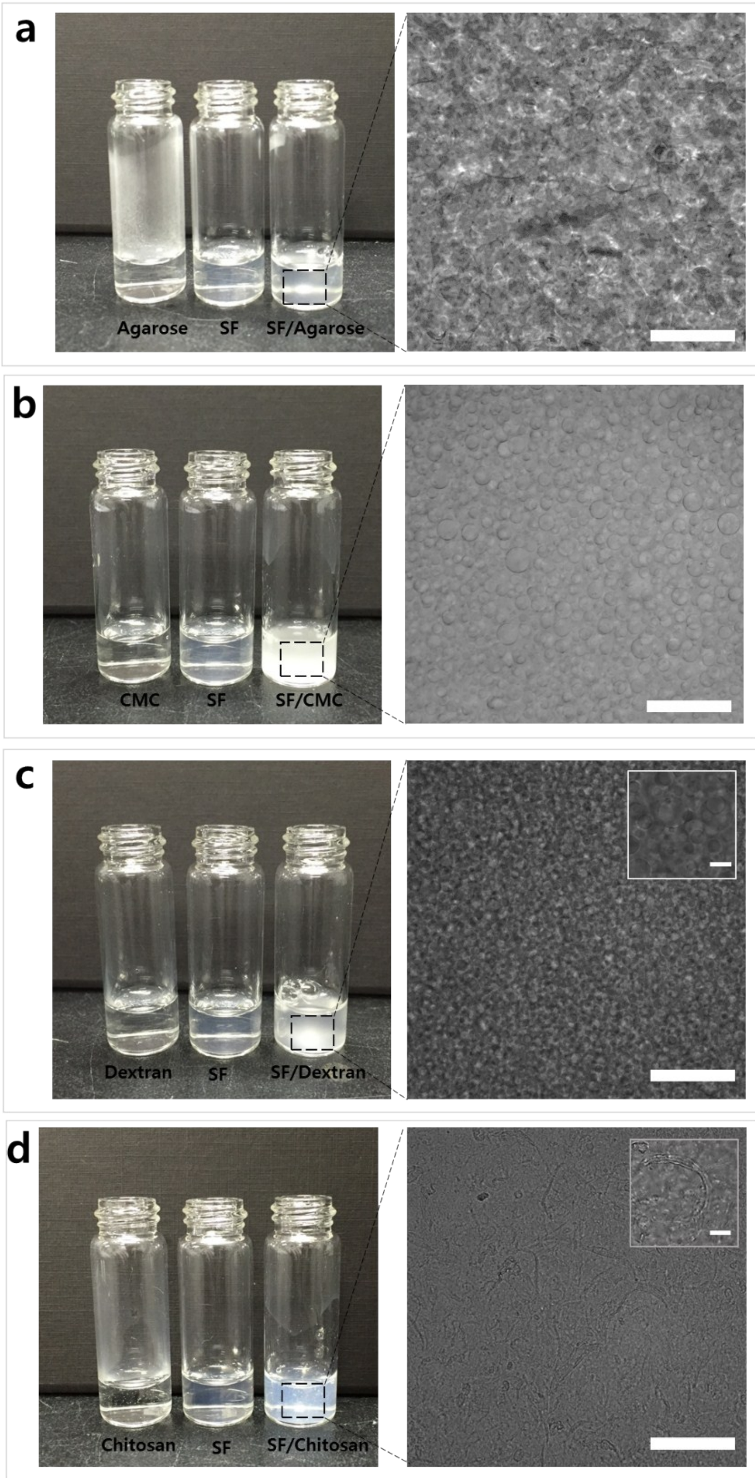

Fig.S2 Photographic and optical images show that phase separation occurred upon mixing of SF and various polysaccharides. a) Agarose/SF blend. b) CMC/SF blend. c) Dextran/SF blend. d) Chitosan/SF blend. The insets in (c and d) were the enlarged images. Scale bars: 200μm (a,b,c,d) and 25μm (insets in c and d).

Table S1 Comparison of polysaccharides possible to induce phase-separation of silk fibroin.

	Biocompatibility	Biodegradability (mechanism)	Mechanical property	Process to prepare hydrogel	Possibility of in situ cell encapsulation
Alginate[1, 2]	Good	Good (Enzymatic)	Weak	Neutral condition/ionic crosslinking	Yes
Chitosan[2, 3]	Good	Good (Enzymatic)	Weak	Acidic condition /ionic-chemical crosslinking	Possible, but need to modify polymer chain
Agarose[4]	Good	Good (not clear)	Weak	Neutral condition /heating-cooling crosslinking	Possible, but difficult
Dextran[5]	Good	Good (Enzymatic)	Weak	Neutral condition /chemical crosslinking	Possible, but need to modify polymer chain
Carboxy[6] methyl cellulose	Good	Good (Enzymatic)	Strong	Neutral condition /chemical crosslinking	Possible, but need to modify polymer chain

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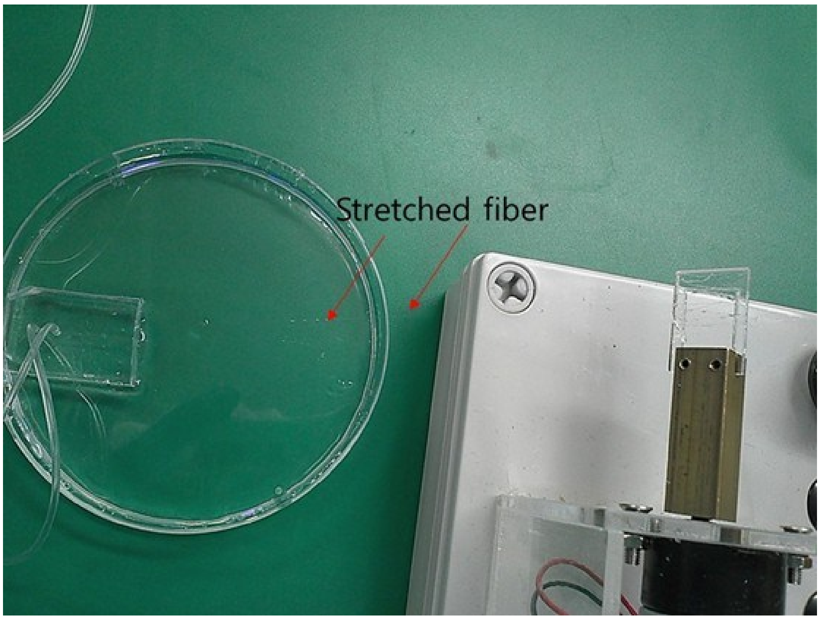

Fig. S3 Fiber stretching by winding on the spool.

Table S2 Fabrication parameters for microfibers.

Fiber code	Weight ratio (SF/alginate)	Flow conditions (ml/h)		Crosslinking method	Continuous fiber	Stretchable fiber	Continuous SF-only fiber
		Sheath	Core				
Alginate	1	30, 50,100	0.6, 1.2, 1.8	$CaCl_2$ (3%, wt%)	Yes	Yes	No
SF1.25 /A1	1.25/1	30, 50,100	0.6, 1.2, 1.8	$CaCl_2$ (3%, wt%)	Yes	Yes	No
SF3.5/A1	3.5/1	30, 50,100	0.6, 1.2, 1.8	$CaCl_2$ (3%, wt%)	Yes	Yes	No
SF8/A1	8/1	30, 50,100	0.6, 1.2, 1.8	$CaCl_2$ (3%, wt%)	Yes	Yes	No
SF10/A1	10/1	30, 50,100	0.6, 1.2, 1.8	$CaCl_2$ (3%, wt%)	Yes	Yes	No
SF15/A1	15/1	30, 50,100	0.6, 1.2, 1.8	$CaCl_2$ (3%, wt%)	Yes	Yes	Yes
SF30/A1	30/1	30, 50,100	0.6, 1.2, 1.8	$CaCl_2$ (3%, wt%)	Yes	Yes	Yes
SF50/A1	50/1	30, 50,100	0.6, 1.2, 1.8	$CaCl_2$ (3%, wt%)	Yes	No	Yes

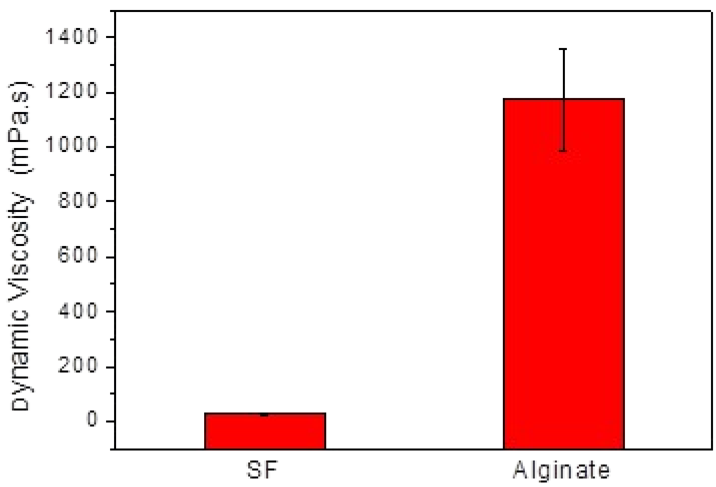

Fig S4. Viscosities of SF (5%) and alginate (5%) measured using a Brookfield viscometer.

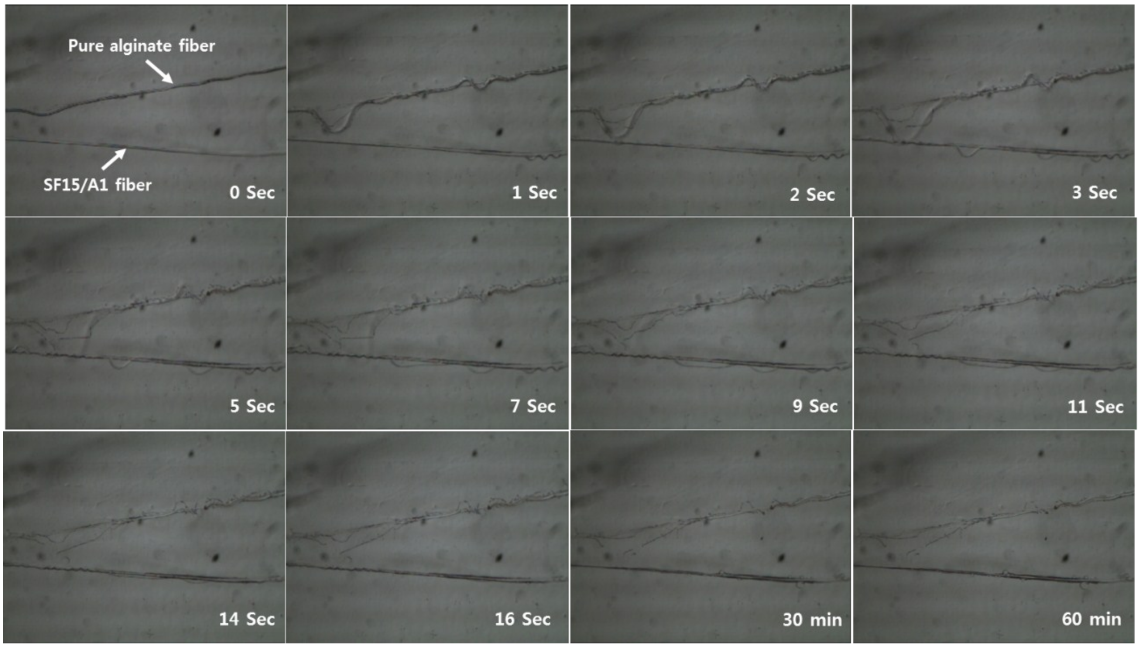

Fig. S5 Snap shots of microscopic images showing that pure alginate fiber rapidly degraded after addition of sodium citrate, on the other hand, SF15/A1 fiber remained intact.

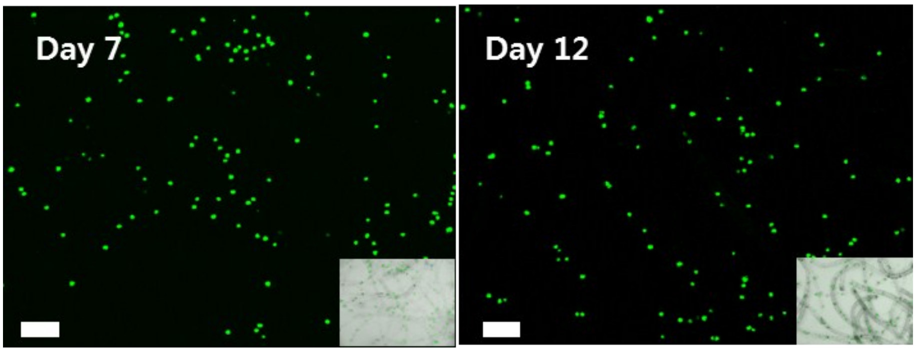

Fig. S6 Live/Dead stain of cells in SF1.25/A1 fibers after 7 and 12 days. Scale bars: 100 μm.