Supporting Information

Engineered Recombinant Hagfish Intermediate Filament Proteins: Unraveling Domain Roles in Synthetic Fiber Formation and Mechanics

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AA Sequences

The amino acid sequences used in making the various protein constructs presented in this study appear in Table S1.

Table S1. Amino acid (AA) sequence of the various recombinant hagfish intermediate filaments (rHIF). The rHIFα and the rHIF$\gamma_{(C387S)}$ correspond to α and γ, respectively.

Construct	AA sequence
N-α	MGHHHHHHHHHHSSGHIDDDDKHMLPRMSISQTVSKSYTKSVSRGGQGVSYSQSSSHKVGGGSVRYGTTYSSGGISRVLGFQGGAGGAASAGFGGSVGGSGLSRVLGGSMVSGYRSGMGVGGLSLSGTAGLPVSLRGVGAGKALHAITSAFRTRVGGPGTSVGGYGVNYSFLPSTAGPSFGGPFGGPFGGPFGGPLGPGYIDPATLPSPDTVQHTRIREKQDLQTLNTKFANLVDQVRTLEQHNAILKAQISMITSPSDTPEGPVNTAVVASTVTATYNAQIEDLRTTNTALHSEIDHLTTIINDITTKYEEQVEVTRTLETDWNTNKDNIDNTYLTIVDLQTKVQGLDEQINTTKQIYNARVREVQAAVTGGPTAAYSIRVDNTHQAIDLTTSLQEMKTHYEVLATKSREEAFTQVQPRIQEMAVTVQAGPQAIIQAKEQIHVFKLQIDSVHREIDRLHRKNTDVEREITVIETNIHTQSDEWTNNINSLKVDLEVIKKQITQYARDYQDLLATKMSLDVEIAAYKKLLDSEETRITS
CRD-α	MGHHHHHHHHHHSSGHIDDDDKHMLPRKQDLQTLNTKFANLVDQVRTLEQHNAILKAQISMITSPSDTPEGPVNTAVVASTVTATYNAQIEDLRTTNTALHSEIDHLTTIINDITTKYEEQVEVTRTLETDWNTNKDNIDNTYLTIVDLQTKVQGLDEQINTTKQIYNARVREVQAAVTGGPTAAYSIRVDNTHQAIDLTTSLQEMKTHYEVLATKSREEAFTQVQPRIQEMAVTVQAGPQAIIQAKEQIHVFKLQIDSVHREIDRLHRKNTDVEREITVIETNIHTQSDEWTNNINSLKVDLEVIKKQITQYARDYQDLLATKMSLDVEIAAYKKLLDSEETRITS
α-C	MGHHHHHHHHHHSSGHIDDDDKHMLPRKQDLQTLNTKFANLVDQVRTLEQHNAILKAQISMITSPSDTPEGPVNTAVVASTVTATYNAQIEDLRTTNTALHSEIDHLTTIINDITTKYEEQVEVTRTLETDWNTNKDNIDNTYLTIVDLQTKVQGLDEQINTTKQIYNARVREVQAAVTGGPTAAYSIRVDNTHQAIDLTTSLQEMKTHYEVLATKSREEAFTQVQPRIQEMAVTVQAGPQAIIQAKEQIHVFKLQIDSVHREIDRLHRKNTDVEREITVIETNIHTQSDEWTNNINSLKVDLEVIKKQITQYARDYQDLLATKMSLDVEIAAYKKLLDSEETRISHGGGITITTNAGTFPGGLSAAPGGGASYAMVPAGVGGVGLAGVGGYGFRSMGGGGGVGYGAGGGGVGYGVGGGFGGGMGMSMSRMSMGAAVGGGSYGSGSGYSGGFGLSSSRAGYSASRKSYSSARSSSRIYTS
N-γ	MGHHHHHHHHHHSSGHIDDDDKHMHNLNRFEMASHSSVSYRSVRTGGTSAMIGSSGYGGSSSSRAMGLGMGAAGLSMGGGSFRVGSAGIGGMGISSGIGGMGISSRAGGMSAYGGAASGGAGGFVSGGVPMLGYGGGAGGFIGGVSPGIMASPAFTAGRAITSAGMSGVVGTLGPAGGMVPSLVSRDEVKNILGTLNQRLASYVDKVRQLTIENETMEEELKNLTGGVPMSPDSTVNLENVETQVTEMLTEVSNLTLERVRLEIDVDHLRATADEIKSKYEFELGVRMQLETDIANMKRDLEAANDMRVDLDSKFNFLTEELTFQRKTQMEELNTLKQQFGRLGPVQTSVIELDNVKSVNLTDALNVMREEYQQVVTKNVQEAETYSKMQIDQIQGISTQTTEQISILDKEINTLEKELQPLNVEYQRLLTTYQTLGDRLTDLQNRESIDLVQFQNTYTRYEQEIEGNQVDLQRQLVTYQQLLDVKTALDAEIATYKKLLEGQELMVTS
CRD-γ	MGHHHHHHHHHHSSGHIDDDDKHMHNLNRFEKNILGTLNQRLASYVDKVRQLTIENETMEEELKNLTGGVPMSPDSTVNLENVETQVTEMLTEVSNLTLERVRLEIDVDHLRATADEIKSKYEFELGVRMQLETDIANMKRDLEAANDMRVDLDSKFNFLTEELTFQRKTQMEELNTLKQQFGRLGPVQTSVIELDNVKSVNLTDALNVMREEYQQVVTKNVQEAETYSKMQIDQIQGISTQTTEQISILDKEINTLEKELQPLNVEYQR

LLTTYQTLGDRLTDLQNRESIDLVQFQNTYTRYEQEIEGNQVDLQRQLVTYQQLLDVKTALDAEIATYKK
LLEGQELMVTS

γ-C MGHHHHHHHHHHSSGHIDDDDKHMHNLNRFEKNILGTLNQRLASYVDKVRQLTIENETMEEELKN
LTGGVPMSPDSTVNLENVETQVTEMLTEVSNLTLERVRLEIDVDHLRATADEIKSKYEFELGVRMQLET
DIANMKRDLEAANDMRVDLDSKFNFLTEELTFQRKTQMEELNTLKQQFGRLGPVQTSVIELDNVKSV
NLTDALNVMREEYQQVVTKNVQEAETYSKMQIDQIQGISTQTTEQISILDKEINTLEKELQPLNVEYQR
LLTTYQTLGDRLTDLQNRESIDLVQFQNTYTRYEQEIEGNQVDLQRQLVTYQQLLDVKTALDAEIATYKK
LLEGQELMVRTAMADDFAHATVVRSGTLGGASSSSVGYGASSTTLGAISGGYSTGGGASYSAGAGGA
SYSAGAGGASYGVGGGYSGGSSAMMEGSSSGGHSMYSSSSMKRSSSKSASASAGGYGTSGHDSTIIL
QQTS

Bioreactor results

Results for each of the bioreactor runs (Table S2) performed for this study (N-α, CRD-α, α-C, N-γ, CRD-γ, and γ-C).

Table S2. The bioreactor runs OD_{600} values, cell mass, and reactor size.

Protein Construct	OD_{600} at induction	Final OD_{600}	Wet cell mass (g)	Bioreactor size (L)
N-α	86	138	338	2
CRD-α	84	128	276	2
α-C	69	96	224	2
N-γ	38	81	132	10
CRD-γ	46	74	172	2
γ-C	58	113	221	2

Mechanical results

The primary mechanical and structural results presented in the main paper were converted to graphical form in Figure S1. These figures help visualize the differences in properties for the different constructs.

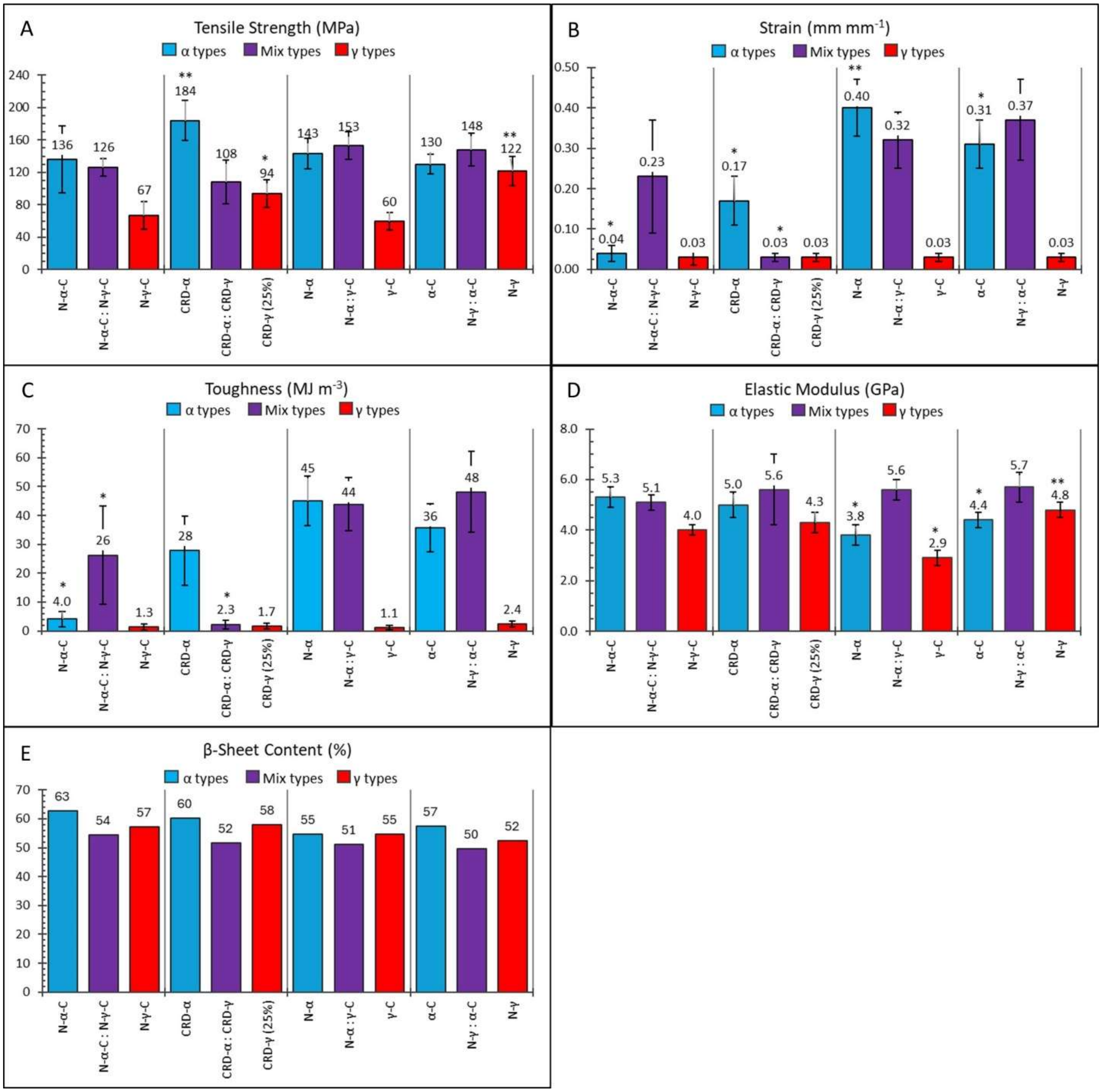

Figure S1. Mechanical and structural properties of the different constructs spun from 20% w/v dopes (CRD-γ at 25%) into SW with a 2X2X stretch factor application. A. Tensile strength, B. Strain, C. Toughness, D. Elastic modulus, E. β-sheet content. Panels A-D are averages with standard deviation error bars. * Indicates a significantly worse property for that protein group, while ** indicates a significantly better property for that protein group.

The mechanical properties of the different protein constructs at various protein concentrations, stretch factors, and bath contents appear in separate tables corresponding to the protein type for each table. These tables only include constructs, concentrations, stretch factors, and bath contents for successfully formed fibers. Table S3 focuses on the rHIFα constructs that need the C-terminus for fiber formation in dH$_2$O. In the table, rHIFα is reduced to N-α-C to indicate the full-length construct that includes both termini.

Table S3. Mechanical properties from various concentrations of the rHIFα constructs spun at multiple stretch factors. Here, dH$_2$O is deionized water, and SW is salt water from Instant Ocean.

	Construct	Water Type	n	Toughness (MJ/m^3)	Tensile Stress (MPa)	Strain (mm/mm)	Diameter (micron)	Elastic Modulus (GPa)
15% w/v								
1X1X	N-α-C	dH$_2$O	6	1.08 ± 0.9	44.8 ± 8.1	0.03 ± 0.02	50.2 ± 1.0	2.1 ± 0.3
	α-C	dH$_2$O	6	11.3 ± 9.7	66.5 ± 15	0.23 ± 0.20	36.4 ± 4.4	3.1 ± 0.9
	N-α-C	SW	10	0.51 ± 0.3	50.5 ± 14	0.02 ± 0.01	66.3 ± 1.2	3.0 ± 0.2
	N-α	SW	8	3.70 ± 2.9	50.4 ± 14	0.11 ± 0.09	56.4 ± 6.2	2.9 ± 0.8
	CRD-α	SW	10	1.22 ± 0.7	93.0 ± 28	0.02 ± 0.01	59.7 ± 3.1	4.2 ± 0.3
	α-C	SW	9	0.87 ± 0.8	64.3 ± 32	0.02 ± 0.01	69.7 ± 9.6	3.1 ± 0.9
1.5X1.5X	N-α-C	dH$_2$O	9	24.0 ± 7.0	66.7 ± 7.6	0.42 ± 0.14	35.0 ± 2.6	2.5 ± 0.8
	N-α-C	SW	9	0.49 ± 0.2	53.1 ± 12	0.02 ± 0.00	56.5 ± 4.5	3.4 ± 0.3
	N-α	SW	5	0.85 ± 0.7	46.5 ± 18	0.02 ± 0.01	47.4 ± 2.5	2.9 ± 0.4
	CRD-α	SW	7	3.20 ± 1.1	144 ± 16	0.04 ± 0.01	42.5 ± 2.7	5.1 ± 0.4
	α-C	SW	10	1.13 ± 0.5	87.6 ± 12	0.02 ± 0.00	42.5 ± 1.5	4.6 ± 0.4
2X2X	N-α-C	dH$_2$O	9	19.3 ± 9.6	60.8 ± 9.5	0.38 ± 0.20	35.5 ± 3.5	2.5 ± 0.8
	N-α-C	SW	10	27.7 ± 9.2	98.6 ± 14	0.33 ± 0.14	34.2 ± 1.9	3.6 ± 0.8
	N-α	SW	7	15.8 ± 12	79.6 ± 33	0.21 ± 0.14	34.5 ± 1.9	3.5 ± 0.7
	CRD-α	SW	10	13.4 ± 4.6	207 ± 26	0.08 ± 0.02	33.2 ± 2.5	6.6 ± 0.8
	α-C	SW	10	10.3 ± 4.2	128 ± 15	0.10 ± 0.03	34.2 ± 2.1	4.5 ± 0.4
2.5X2.5X	N-α-C	SW	10	21.0 ± 9.9	137 ± 23	0.18 ± 0.08	30.5 ± 1.9	4.5 ± 0.9
	α-C	SW	8	2.55 ± 2.0	111 ± 26	0.04 ± 0.02	31.6 ± 5.1	4.5 ± 1.1
20% w/v								
1X1X	N-α-C	dH$_2$O	10	2.50 ± 1.4	62.3 ± 13	0.05 ± 0.02	58.3 ± 5.7	2.5 ± 0.3
	α-C	dH$_2$O	9	2.17 ± 1.9	54.9 ± 28	0.06 ± 0.04	54.5 ± 4.1	2.3 ± 0.2
	N-α-C	SW	10	0.94 ± 0.3	74.7 ± 12	0.03 ± 0.01	73.3 ± 3.7	3.3 ± 0.5
	N-α	SW	10	1.27 ± 0.9	58.5 ± 15	0.04 ± 0.03	73.9 ± 3.8	2.5 ± 0.4
1.5X1.5X	N-α-C	dH$_2$O	13	18.6 ± 16	74.8 ± 18	0.30 ± 0.27	45.2 ± 4.7	2.7 ± 0.5
	α-C	dH$_2$O	10	17.7 ± 11	69.6 ± 14	0.32 ± 0.17	26.2 ± 2.8	2.6 ± 0.8
	N-α-C	SW	8	1.29 ± 0.6	90.9 ± 20	0.03 ± 0.01	60.8 ± 9.7	3.9 ± 0.5
	N-α	SW	8	35.5 ± 17	76.7 ± 9.8	0.58 ± 0.25	41.1 ± 4.2	3.4 ± 0.6
	CRD-α	SW	7	3.78 ± 1.9	96.6 ± 8.1	0.06 ± 0.02	60.8 ± 2.1	3.4 ± 0.3
	α-C	SW	10	1.88 ± 0.6	96.5 ± 19	0.03 ± 0.01	58.0 ± 3.4	3.4 ± 0.4
2X2X	N-α-C	dH$_2$O	18	16.5 ± 12	91.5 ± 25	0.19 ± 0.11	38.5 ± 4.1	3.1 ± 0.4
2.5X2.5X	N-α-C	SW	9	2.31 ± 1.2	147 ± 40	0.03 ± 0.01	38.5 ± 4.7	5.9 ± 0.6
	N-α	SW	10	25.6 ± 6.5	200 ± 26	0.17 ± 0.03	23.1 ± 1.3	5.3 ± 0.7
	CRD-α	SW	8	40.8 ± 9.4	178 ± 27	0.30 ± 0.07	37.2 ± 2.2	4.5 ± 0.5
	α-C	SW	10	19.4 ± 8.1	188 ± 38	0.13 ± 0.04	34.5 ± 1.4	5.2 ± 0.6
25% w/v								
1X1X	N-α-C	dH$_2$O	8	3.68 ± 2.8	60.5 ± 12	0.08 ± 0.06	64.7 ± 5.2	2.5 ± 0.7
	N-α	dH$_2$O	8	7.05 ± 3.4	67.6 ± 22	0.13 ± 0.06	46.1 ± 11	2.8 ± 0.8
	α-C	dH$_2$O	4	0.57 ± 0.6	34.4 ± 18	0.03 ± 0.02	39.5 ± 6.6	2.4 ± 0.8
	N-α-C	SW	10	0.71 ± 0.2	55.6 ± 7.6	0.03 ± 0.01	80.9 ± 1.9	2.4 ± 0.2
	N-α	SW	8	1.35 ± 0.2	66.6 ± 8.3	0.04 ± 0.00	81.4 ± 4.4	2.3 ± 0.2

	CRD-α	SW	9	2.35 ± 1.1	98.4 ± 23	0.04 ± 0.01	78.1 ± 4.5	3.0 ± 0.4
	α-C	SW	10	1.42 ± 0.5	78.5 ± 14	0.03 ± 0.01	78.8 ± 5.0	2.9 ± 0.4
1.5X1.5X	N-α-C	dH$_2$O	10	27.2 ± 14	61.6 ± 7.2	0.53 ± 0.27	51.9 ± 5.4	2.1 ± 0.8
	N-α	dH$_2$O	7	3.39 ± 2.8	64.7 ± 3.1	0.07 ± 0.05	56.0 ± 3.2	2.5 ± 0.1
	α-C	dH$_2$O	9	21.4 ± 11	68.2 ± 7.6	0.37 ± 0.18	34.3 ± 0.9	2.3 ± 0.2
	N-α-C	SW	10	21.5 ± 23	85.4 ± 11	0.29 ± 0.29	57.0 ± 5.8	3.0 ± 0.4
	N-α	SW	6	2.32 ± 1.1	69.9 ± 2.3	0.05 ± 0.02	69.2 ± 4.0	2.5 ± 0.2
	CRD-α	SW	8	3.46 ± 1.4	113 ± 19	0.05 ± 0.01	66.4 ± 4.9	3.5 ± 0.3
	α-C	SW	9	34.6 ± 16	94.4 ± 5.7	0.42 ± 0.18	54.9 ± 2.0	2.8 ± 0.7
2X2X	N-α-C	SW	10	30.0 ± 8.2	152 ± 10	0.23 ± 0.05	40.6 ± 0.5	4.2 ± 0.2
	N-α	SW	9	44.0 ± 5.2	110 ± 10	0.48 ± 0.09	47.5 ± 2.5	3.1 ± 0.2
	CRD-α	SW	8	17.0 ± 11	212 ± 37	0.11 ± 0.05	40.8 ± 3.2	5.3 ± 0.8
	α-C	SW	9	27.3 ± 5.2	117 ± 11	0.26 ± 0.05	47.6 ± 1.1	3.5 ± 0.6
2.5X2.5X	N-α-C	SW	9	19.6 ± 5.3	139 ± 10	0.17 ± 0.04	40.7 ± 0.6	4.7 ± 1.1
	N-α	SW	10	28.0 ± 5.1	198 ± 11	0.18 ± 0.03	38.4 ± 0.7	4.5 ± 0.2
	CRD-α	SW	8	28.9 ± 20	189 ± 29	0.18 ± 0.10	41.5 ± 2.0	4.6 ± 0.4
	α-C	SW	10	32.2 ± 11	118 ± 45	0.35 ± 0.11	44.4 ± 7.5	3.1 ± 1.5

Mechanical data of the fibers from combining the rHIFα and rHIFγ$_{(C387S)}$ constructs in a 1:1 ratio (Table S4). In this table, the rHIFα and rHIFγ$_{(C387S)}$ full-length proteins are indicated by α and γ, respectively.

Table S4. Mechanical properties from various concentrations of the 1:1 rHIFα: rHIFγ$_{(C387S)}$ constructs spun at multiple stretch factors. Here, dH$_2$O is deionized water, and SW is salt water from Instant Ocean.

	Constructs	Water Type	n	Toughness (MJ/m^3)	Tensile Stress (MPa)	Strain (mm/mm)	Diameter (micron)	Elastic Modulus (GPa)
15% w/v								
1X1X	α: γ	dH$_2$O	11	2.48 ± 1.5	58.6 ± 8.1	0.05 ± 0.03	52.9 ± 0.6	2.4 ± 0.1
1.5X1.5X	α: γ	dH$_2$O	15	27.7 ± 14	64.1 ± 6.2	0.52 ± 0.29	41.6 ± 3.1	2.5 ± 0.2
	α: γ	SW	7	0.34 ± 0.2	40.4 ± 11	0.01 ± 0.00	50.3 ± 0.4	3.0 ± 0.1
2X2X	α: γ	dH$_2$O	20	28.9 ± 9.3	91.8 ± 15	0.38 ± 0.14	30.5 ± 2.1	2.9 ± 0.5
	α: γ	SW	7	22.1 ± 12	56.5 ± 18	0.50 ± 0.13	36.6 ± 0.4	3.1 ± 0.5
20% w/v								
1X1X	α: γ	dH$_2$O	8	2.24 ± 1.4	49.8 ± 11	0.06 ± 0.02	70.3 ± 5.5	2.1 ± 0.5
	N-α: γ-C	dH$_2$O	9	1.97 ± 1.3	62.8 ± 18	0.04 ± 0.02	57.7 ± 3.7	3.2 ± 0.5
	N-γ: α-C	dH$_2$O	8	5.11 ± 4.4	59.6 ± 7.6	0.11 ± 0.08	52.2 ± 2.2	2.9 ± 0.2
	α: γ	SW	8	1.38 ± 1.1	84.0 ± 21	0.02 ± 0.01	66.9 ± 7.8	4.8 ± 0.3
	CRD-α: CRD-γ	SW	8	0.65 ± 0.4	70.1 ± 19	0.02 ± 0.01	66.5 ± 2.2	5.5 ± 0.9
	N-α: γ-C	SW	8	0.82 ± 0.6	79.3 ± 30	0.02 ± 0.01	65.3 ± 4.9	5.4 ± 0.3
	N-γ: α-C	SW	8	0.36 ± 0.2	53.0 ± 20	0.01 ± 0.00	65.1 ± 4.0	5.0 ± 0.2
1.5X1.5X	α: γ	dH$_2$O	12	37.6 ± 4.8	68.5 ± 8.2	0.63 ± 0.07	45.5 ± 2.2	2.2 ± 0.2
	N-α: γ-C	dH$_2$O	7	1.74 ± 1.5	64.6 ± 8.9	0.04 ± 0.03	50.3 ± 3.0	3.0 ± 0.4
	N-γ: α-C	dH$_2$O	10	41.7 ± 20	74.5 ± 5.5	0.60 ± 0.28	39.1 ± 3.8	3.0 ± 0.3
	α: γ	SW	10	1.78 ± 1.3	90.7 ± 29	0.03 ± 0.01	49.1 ± 1.6	5.1 ± 0.1
	CRD-α: CRD-γ	SW	8	1.03 ± 1.0	77.8 ± 40	0.02 ± 0.01	49.0 ± 1.5	5.8 ± 0.6
	N-α: γ-C	SW	6	2.95 ± 2.1	117 ± 21	0.04 ± 0.02	52.2 ± 4.7	5.7 ± 0.2
	N-γ: α-C	SW	7	0.50 ± 0.3	63.3 ± 19	0.02 ± 0.01	62.7 ± 6.6	5.1 ± 0.3
2.5X2.5X	α: γ	SW	12	31.8 ± 12	133 ± 8.6	0.27 ± 0.10	34.5 ± 1.1	4.9 ± 0.2
	N-α: γ-C	SW	10	25.3 ± 6.9	239 ± 16	0.13 ± 0.03	30.5 ± 1.0	7.0 ± 0.5

	N-γ: α-C	SW	9	42.0 ± 16	189 ± 25	0.26 ± 0.10	32.0 ± 1.4	6.7 ± 0.4
25% w/v								
1X1X	α: γ	dH$_2$O	10	0.74 ± 0.3	50.6 ± 7.7	0.02 ± 0.01	81.8 ± 1.7	2.6 ± 0.1
	α: γ	SW	9	0.65 ± 0.5	64.4 ± 22	0.02 ± 0.01	71.6 ± 7.1	4.5 ± 0.3
1.5X1.5X	α: γ	dH$_2$O	10	3.52 ± 2.3	56.8 ± 9.3	0.07 ± 0.04	64.8 ± 1.0	2.6 ± 0.1
	α: γ	SW	9	0.59 ± 0.4	65.2 ± 21	0.02 ± 0.00	77.3 ± 8.4	4.4 ± 0.4
2X2X	α: γ	dH$_2$O	10	37.4 ± 17	156 ± 24	0.29 ± 0.12	30.6 ± 1.7	4.5 ± 0.5
	α: γ	SW	8	3.34 ± 3.1	99.4 ± 26	0.04 ± 0.03	51.6 ± 7.1	5.0 ± 0.3
	α: γ	dH$_2$O	11	29.8 ± 12	87.4 ± 16	0.40 ± 0.13	38.4 ± 2.3	2.4 ± 0.5
2.5X2.5X	α: γ	SW	10	15.1 ± 14	125 ± 13	0.13 ± 0.10	45.3 ± 4.6	5.1 ± 0.2

The final table (Table S5) looks at the mechanical properties of rHIFγ$_{(C387S)}$ constructs. N-γ-C indicates the full-length construct (of rHIFγ$_{(C387S)}$) that includes both termini.

Table S5. Mechanical properties from various concentrations of the rHIFγ$_{(C387S)}$ constructs spun at multiple stretch factors. Here, dH$_2$O is deionized water, and SW is salt water from Instant Ocean.

	Construct	**Water Type**	**n**	**Toughness (MJ/m^3)**	**Tensile Stress (MPa)**	**Strain (mm/mm)**	**Diameter (micron)**	**Elastic Modulus (GPa)**
15% w/v								
1X1X	N-γ-C	dH$_2$O	10	1.11 ± 0.84	52.9 ± 11	0.03 ± 0.01	54.7 ± 0.5	2.8 ± 0.2
	γ-C	dH$_2$O	10	10.5 ± 8.8	79.6 ± 24	0.14 ± 0.09	51.0 ± 10	2.8 ± 0.8
	N-γ-C	SW	10	0.40 ± 0.3	49.7 ± 19	0.01 ± 0.01	47.7 ± 8.8	3.8 ± 0.4
	γ-C	SW	9	0.04 ± 0.0	10.9 ± 5.3	0.01 ± 0.00	68.6 ± 5.8	1.7 ± 0.8
1.5X1.5X	N-γ-C	dH$_2$O	10	34.3 ± 12	70 ± 2.6	0.54 ± 0.19	37.3 ± 0.4	2.9 ± 0.2
	N-γ	dH$_2$O	11	1.23 ± 0.7	58.9 ± 15	0.03 ± 0.01	42.6 ± 4.6	2.7 ± 0.6
	N-γ-C	SW	10	0.40 ± 0.3	48.1 ± 21	0.01 ± 0.01	46.9 ± 4.3	3.8 ± 0.3
	N-γ	SW	7	1.09 ± 0.4	73.4 ± 11	0.03 ± 0.01	38.7 ± 2.0	3.3 ± 0.9
	γ-C	SW	10	0.16 ± 0.1	24.5 ± 11	0.01 ± 0.00	53.7 ± 3.0	2.5 ± 0.2
2X2X	N-γ-C	dH$_2$O	7	28.8 ± 15	92.7 ± 21	0.35 ± 0.15	29.4 ± 2.8	3.4 ± 0.6
	N-γ-C	SW	11	4.28 ± 3.1	105 ± 20	0.05 ± 0.03	31.6 ± 1.3	4.4 ± 0.5
	N-γ	SW	9	25.0 ± 8.5	83.4 ± 4.0	0.35 ± 0.11	29.2 ± 0.5	3.4 ± 0.3
	γ-C	SW	8	0.34 ± 0.3	33.2 ± 18	0.02 ± 0.01	40.9 ± 3.0	2.5 ± 0.8
20% w/v								
1X1X	N-γ-C	dH$_2$O	11	1.98 ± 1.3	46.7 ± 4.7	0.05 ± 0.03	76.9 ± 2.3	2.1 ± 0.1
	N-γ	dH$_2$O	8	17.1 ± 16	73.1 ± 18	0.27 ± 0.26	38.8 ± 3.5	3.1 ± 0.6
	γ-C	dH$_2$O	9	0.26 ± 0.3	28 ± 10	0.02 ± 0.01	54.2 ± 1.7	2.1 ± 0.2
	N-γ-C	SW	10	0.41 ± 0.2	41.8 ± 12	0.01 ± 0.00	62.5 ± 7.2	3.5 ± 0.3
	N-γ	SW	9	0.92 ± 0.6	67.7 ± 28	0.02 ± 0.01	55.5 ± 3.6	3.6 ± 0.7
	CRD-γ	SW	9	1.43 ± 0.9	60.7 ± 23	0.04 ± 0.01	113 ± 29	2.0 ± 0.7
1.5X1.5X	N-γ-C	dH$_2$O	12	50.8 ± 6.6	70.0 ± 6.4	0.84 ± 0.09	43.5 ± 2.0	2.5 ± 0.3
	N-γ	dH$_2$O	8	63.7 ± 43	101 ± 38	0.78 ± 0.27	30.4 ± 5.1	3.2 ± 0.8
	γ-C	dH$_2$O	5	0.39 ± 0.4	33.6 ± 15	0.02 ± 0.01	42.5 ± 5.8	2.1 ± 0.3
	N-γ-C	SW	8	0.47 ± 0.2	50.9 ± 10	0.02 ± 0.00	46.7 ± 3.3	3.7 ± 0.3
	N-γ	SW	6	0.87 ± 0.4	75.1 ± 22	0.02 ± 0.01	47.4 ± 3.0	3.7 ± 0.6
	CRD-γ	SW	10	1.20 ± 0.9	74.2 ± 31	0.03 ± 0.01	59.0 ± 5.8	3.3 ± 0.5
	γ-C	SW	10	0.54 ± 0.3	48.6 ± 11	0.02 ± 0.01	59.2 ± 8.6	2.6 ± 0.3
2X2X	N-γ-C	dH$_2$O	11	38.5 ± 9.9	95.9 ± 20	0.46 ± 0.03	36.5 ± 3.6	3.2 ± 0.7
	N-γ	dH$_2$O	10	59.2 ± 23	92.8 ± 29	0.75 ± 0.14	28.2 ± 3.2	3.0 ± 0.8
	γ-C	dH$_2$O	8	0.35 ± 0.3	33.4 ± 14	0.02 ± 0.01	37.4 ± 1.3	2.1 ± 0.4
2.5X2.5X	N-γ-C	SW	10	9.87 ± 7.5	87.2 ± 10	0.13 ± 0.09	35.6 ± 2.9	4.1 ± 0.3
	N-γ	SW	10	15.6 ± 8.7	178 ± 32	0.11 ± 0.07	27.4 ± 2.9	4.9 ± 1.2
	γ-C	SW	11	4.76 ± 3.0	78.8 ± 8.8	0.08 ± 0.04	33.1 ± 1.5	3.4 ± 0.2

25% w/v								
1X1X	N-γ-C	dH_2O	7	4.32 ± 4.1	56.5 ± 5.2	0.09 ± 0.07	60.7 ± 8.9	2.1 ± 0.2
	N-γ	dH_2O	5	0.61 ± 0.6	32.7 ± 35	0.05 ± 0.06	70.2 ± 26	2.0 ± 1.7
	γ-C	dH_2O	9	0.06 ± 0.0	10.7 ± 4.5	0.02 ± 0.00	61.4 ± 7.5	1.0 ± 0.2
	N-γ-C	SW	11	0.99 ± 0.4	71.8 ± 13	0.03 ± 0.01	69.4 ± 3.5	3.1 ± 0.2
	N-γ	SW	9	0.39 ± 0.4	32 ± 16	0.02 ± 0.01	111 ± 7.3	2.2 ± 0.3
	CRD-γ	SW	11	0.62 ± 0.5	51.9 ± 27	0.02 ± 0.01	87.8 ± 22	3.1 ± 0.9
	γ-C	SW	14	0.38 ± 0.2	40.7 ± 7.2	0.02 ± 0.00	79.0 ± 3.8	2.4 ± 0.3
1.5X1.5X	N-γ-C	dH_2O	10	21.9 ± 10.5	73.3 ± 16	0.33 ± 0.14	46.0 ± 4.4	2.5 ± 0.5
	γ-C	dH_2O	12	0.77 ± 0.3	48.4 ± 10	0.03 ± 0.01	51.0 ± 8.3	2.3 ± 0.5
	N-γ-C	SW	10	1.13 ± 0.3	78.4 ± 8.8	0.03 ± 0.00	63.3 ± 1.0	3.3 ± 0.1
	N-γ	SW	8	2.12 ± 1.0	102 ± 23	0.04 ± 0.01	64.6 ± 9.1	3.3 ± 0.6
	CRD-γ	SW	11	1.54 ± 0.8	79.9 ± 11	0.03 ± 0.01	63.3 ± 3.7	3.9 ± 0.2
2X2X	N-γ-C	dH_2O	11	12.1 ± 5.3	94.6 ± 28	0.15 ± 0.05	37.3 ± 4.4	3.2 ± 0.7
	N-γ-C	SW	12	22.2 ± 13	116 ± 9.7	0.21 ± 0.11	43.0 ± 1.2	4.2 ± 0.2
	N-γ	SW	6	0.66 ± 0.6	58.7 ± 28	0.02 ± 0.01	61.5 ± 2.0	3.2 ± 0.9
2.5X2.5X	N-γ-C	SW	11	13.6 ± 8.1	144 ± 13	0.11 ± 0.06	39.2 ± 3.0	4.8 ± 0.3
	N-γ	SW	12	37.9 ± 27	108 ± 6.5	0.42 ± 0.29	53.3 ± 2.3	3.5 ± 0.2