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APPENDICES

Appendix A Total amino acid composition of silk sericin from four different species of Thai silk cocoon

The total amino acid analysis of silk sericin using HPLC techniques was repeated and the repeated HPLC chromatograms are shown in Figure A1-A4

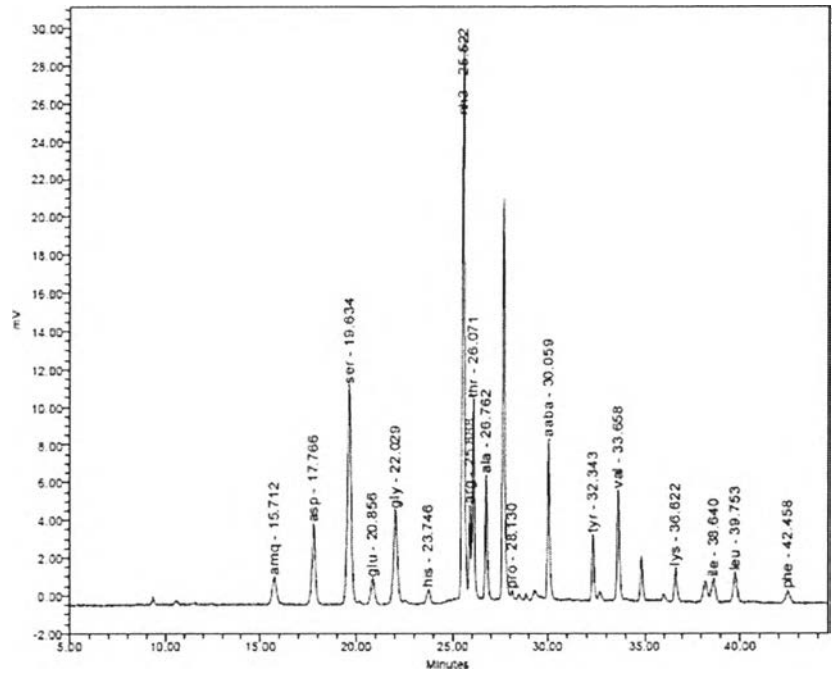

Figure A1 HPLC chromatogram of silk sericin in Nang Noi species

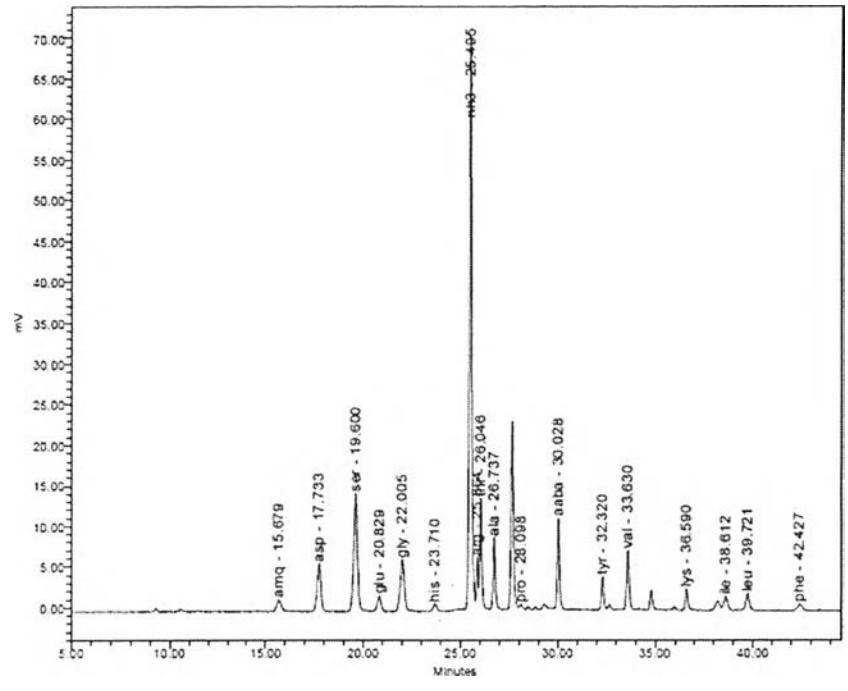

Figure A2 HPLC chromatogram of silk sericin in Nang Lai species

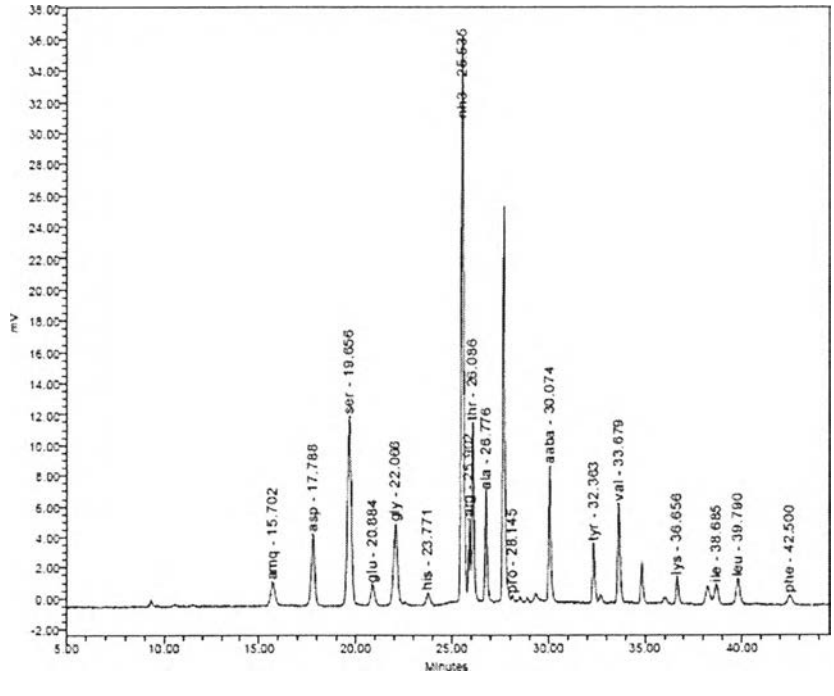

Figure A3 HPLC chromatogram of silk sericin in Dok Bua species

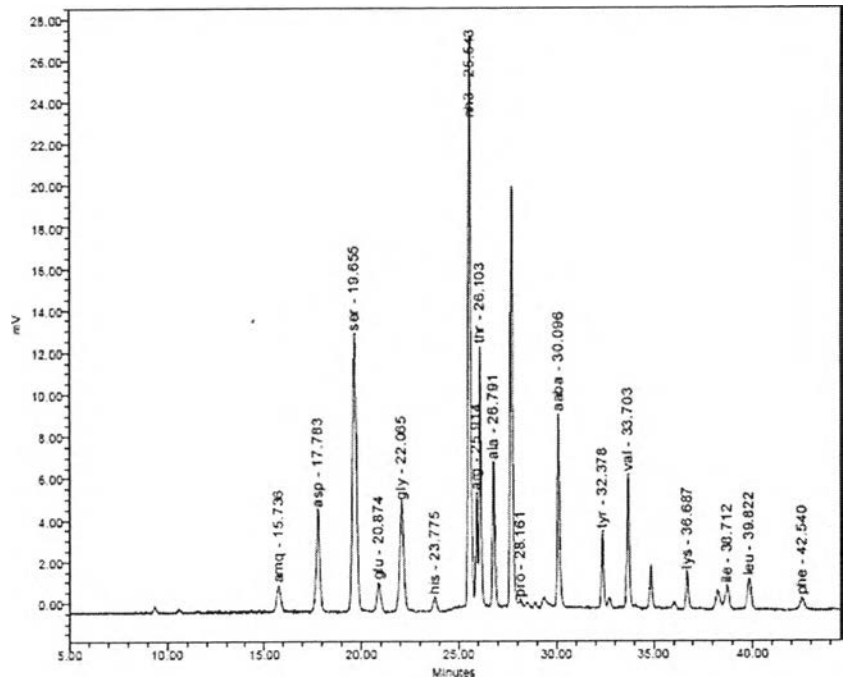

Figure A4 HPLC chromatogram of silk sericin in Luang Pairote species

Appendix B Thermal Stability of silk sericin/PVA/clay aerogel

Table B1 Thermal behavior of uncross-linked silk sericin/PVA/clay aerogel with various contents of silk sericin and clay

Batch	Td onset (°C)	Peak decomposition (°C)	Char residual (%)	Moisture content (%)
C2PVA5SS1	271.1	304	30.4	1.5
C2PVA5SS2	273.7	314.2	33.2	2
C2PVA5SS3	276.3	313	30.7	2.3
C2PVA5SS4	275.8	317.4	36.1	2.3
C4PVA5SS1	261.8	293.1	43.3	1.5
C4PVA5SS2	270.2	309.7	41.5	1.6
C4PVA5SS3	272.4	312.4	44.5	1.6
C4PVA5SS4	272	317.3	41.3	1.8
C6PVA5SS1	255.9	285.7	52.9	1.9
C6PVA5SS2	266.6	305.8	52	1.6
C6PVA5SS3	273.1	317.6	51.3	1.7
C6PVA5SS4	271.6	316.8	46.6	1.6
C8PVA5SS1	257.5	286.7	63	1.7
C8PVA5SS2	263.1	263.5	59.2	2.1
C8PVA5SS3	268.1	309.5	59.61	1.28
C8PVA5SS4	265.2	309.3	50.7	1.5

Table B2 Thermal behavior of cross-linked silk sericin/PVA/clay aerogel with various contents of silk sericin, clay bentonite and glutaraldehyde

Batch	Td onset (°C)	Peak decomposition (°C)	Char residual (%)	Moisture content (%)
C2PVA5SS1 0.7GT	266.9	302.9	37.2	1.1
C2PVA5SS2 0.7GT	271.6	313.2	33.8	2.1
C2PVA5SS3 0.7GT	273.9	313.1	32	3.8
C2PVA5SS4 0.7GT	273.7	318.5	32.7	2.4
C4PVA5SS1 0.7GT	261.4	294.4	47.9	1.3
C4PVA5SS2 0.7GT	266.2	307.2	45.6	1.9
C4PVA5SS3 0.7GT	273.9	313.1	32	3.8
C4PVA5SS4 0.7GT	271.6	316	39.8	2.4
C6PVA5SS1 0.7GT	257.4	289	55.9	1.1
C6PVA5SS2 0.7GT	262.9	301.8	55	1.4
C6PVA5SS3 0.7GT	264.7	306.4	53.2	1.9
C6PVA5SS4 0.7GT	265.3	311.2	48.4	1.7
C8PVA5SS1 0.7GT	256.9	288.5	61.9	1.3
C8PVA5SS2 0.7GT	256.7	293.1	59.2	1
C8PVA5SS3 0.7GT	261.9	302.5	53.9	1.7
C8PVA5SS4 0.7GT	262.8	306.8	53.9	2.2
C2PVA5SS1 0.5GT	265.1	302.5	32.7	1.2
C2PVA5SS2 0.5GT	279.5	322	27.8	1.5
C2PVA5SS3 0.5GT	276.1	317.7	32	1.1
C2PVA5SS4 0.5GT	271.7	314.2	27.9	2.1
C4PVA5SS1 0.5GT	261.8	297.2	45.8	1
C4PVA5SS2 0.5GT	265.5	307.2	45.7	1.6
C4PVA5SS3 0.5GT	267.6	312	44.5	1.8
C4PVA5SS4 0.5GT	271.5	315.3	43	1.5

Batch	Td onset (°C)	Peak decomposition (°C)	Char residual (%)	Moisture content (%)
C6PVA5SS1 0.5GT	258.5	292.9	55.3	0.7
C6PVA5SS2 0.5GT	260.3	299.8	50.5	1.1
C6PVA5SS3 0.5GT	261.6	307.9	53	1.2
C6PVA5SS4 0.5GT	269	313.6	47.2	1.7
C8PVA5SS1 0.5GT	256.1	288.3	58.6	0.4
C8PVA5SS2 0.5GT	257.6	295.3	57.9	1.3
C8PVA5SS3 0.5GT	260.7	303.2	54.5	2.1
C8PVA5SS4 0.5GT	263.6	310.1	54	1.3
C2PVA5SS1 0.3GT	262.4	300.4	31.7	1.9
C2PVA5SS2 0.3GT	274.8	316.5	32	1.8
C2PVA5SS3 0.3GT	272.2	312	33.8	2.4
C2PVA5SS4 0.3GT	276.8	319.6	28.5	1.9
C4PVA5SS1 0.3GT	259.2	293.2	45.1	1.3
C4PVA5SS2 0.3GT	270.1	312.2	45.7	1.7
C4PVA5SS3 0.3GT	274.8	318.2	44.5	1.6
C4PVA5SS4 0.3GT	271.4	312.6	40.9	2
C6PVA5SS1 0.3GT	254	285.3	56.2	1.3
C6PVA5SS2 0.3GT	263.1	302.5	52.1	1.2
C6PVA5SS3 0.3GT	266	308.4	49.9	1.9
C6PVA5SS4 0.3GT	268.7	313.3	47	1.7
C8PVA5SS1 0.3GT	253.5	286.5	58	0.9
C8PVA5SS2 0.3GT	258.5	296.3	58.8	1.3
C8PVA5SS3 0.3GT	262.9	304.8	56.5	1.5
C8PVA5SS4 0.3GT	262.5	305.9	53.1	1.7

Appendix C Mechanical properties of silk sericin/PVA/clay aerogel

Table C1 Mechanical properties of uncross-linked silk sericin/PVA/clay aerogel with various contents of silk sericin and clay

Samples	Initial modulus (kPa)	Young's modulus (kPa)	Stiffness
C2PVA5SS1	238±20	2642±807	20940±2888
C2PVA5SS2	846±49	5074±193	47847±3194
C2PVA5SS3	1633±319	6647±66	65352±2411
C2PVA5SS4	2774±182	9083±271	93667±2104
C4PVA5SS1	1094±232	3637±390	37447±2884
C4PVA5SS2	1321±164	6858±227	71046±3069
C4PVA5SS3	2664±194	7530±321	78378±5655
C4PVA5SS4	4121±595	10145±838	101167±8430
C6PVA5SS1	1896±320	5565±674	65297±6394
C6PVA5SS2	2021±103	2215±203	19354±1276
C6PVA5SS3	2753±74	7237±625	79523.2±8544
C6PVA5SS4	4276±473	11309±756	110200±7980
C8PVA5SS1	1493±130	6949±748	77628±7695
C8PVA5SS2	2186±512	7215±458	78492±6283
C8PVA5SS3	3539±320	6953±346	73246±5625
C8PVA5SS4	5724±245	8952±724	109360±1783

Table C2 Mechanical properties of cross-linked silk sericin/PVA/clay aerogel with various contents of silk sericin, clay and glutarldehyde

Samples	Initial modulus (kPa)	Young's modulus (kPa)	Stiffness (kN/m^2)
C2PVA5SS1 0.7GT	580±40	4460±513	49280±5485
C2PVA5SS2 0.7GT	1353±49	7603±802	62956±1493
C2PVA5SS3 0.7GT	2261±245	8903±769	80840±269
C2PVA5SS4 0.7GT	4429±866	19890±1287	111235±21353
C4PVA5SS1 0.7GT	1497±126	6200±328	63734±4053
C4PVA5SS2 0.7GT	1570±229	9231±1205	93421±10398
C4PVA5SS3 0.7GT	3362±351	7382±1040	82819±268
C4PVA5SS4 0.7GT	4671±1049	12660±1140	84924±7965
C6PVA5SS1 0.7GT	2943±309	6330±780	67901±7625
C6PVA5SS2 0.7GT	3673±103	7706±875	66832±4683
C6PVA5SS3 0.7GT	4671±710	7904±431	81496±6339
C6PVA5SS4 0.7GT	6963±666	14579±1427	108946±16768
C8PVA5SS1 0.7GT	2656±373	4775±224	56158±3607
C8PVA5SS2 0.7GT	2962±456	7188±899	66832±4683
C8PVA5SS3 0.7GT	4764±261	10915±1947	106839±20450
C8PVA5SS4 0.7GT	9300±1658	12417±1657	107177±14215
C2PVA5SS1 0.5GT	1986±124	7432±415	69272±6936
C2PVA5SS2 0.5GT	2356±84	7896±279	83220±7022
C2PVA5SS3 0.5GT	3000±264	10442±1111	92443±12018
C2PVA5SS4 0.5GT	5185±854	12359±875	75355±3884
C4PVA5SS1 0.5GT	2600±489	7219±597	68985±6509
C4PVA5SS2 0.5GT	2983±134	7909±881	79063±6793
C4PVA5SS3 0.5GT	5402±1513	9038±919	55245±865
C4PVA5SS4 0.5GT	6534±695	10487±614	10463±5382
C6PVA5SS1 0.5GT	2959±536	7104±812	68282±7808

Samples	Initial modulus (kPa)	Young's modulus (kPa)	Stiffness (kN/m^2)
C6PVA5SS2 0.5GT	4728±279	8856±564	89257±3532
C6PVA5SS3 0.5GT	6919±1128	11055	121369
C6PVA5SS4 0.5GT	9922±1082	14549±1042	103308±4671
C8PVA5SS1 0.5GT	3134±107	7111±331	81338±1037
C8PVA5SS2 0.5GT	4045±494	6367±1035	70189±11411
C8PVA5SS3 0.5GT	4989±659	10124±873	98936±12451
C8PVA5SS4 0.5GT	5660±319	8270±45	68159±9129
C2PVA5SS1 0.3GT	1197±245	6255±50	59479±3383
C2PVA5SS2 0.3GT	1005±133	6151±496	55220±3873
C2PVA5SS3 0.3GT	2564±712	11598±1487	71454±9370
C2PVA5SS4 0.3GT	5168±1248	12153±1210	71454±9370
C4PVA5SS1 0.3GT	2032±128	7347±516	74665±6907
C4PVA5SS2 0.3GT	2285±437	9805±1752	96942±16833
C4PVA5SS3 0.3GT	3846±940	12050±566	75129±3772
C4PVA5SS4 0.3GT	3925±567	10274±696	77408±5953
C6PVA5SS1 0.3GT	3292±469	7219±335	77107±4482
C6PVA5SS2 0.3GT	4255±71	10165±2367	61687±7653
C6PVA5SS3 0.3GT	6004±731	8821±1424	96808±9426
C6PVA5SS4 0.3GT	6341±553	12069±1363	99882±7898
C8PVA5SS1 0.3GT	4330±922	7070±907	63829±9127
C8PVA5SS2 0.3GT	5716±481	8152±576	9050±7117
C8PVA5SS3 0.3GT	5110±931	8310±291	96746±4003
C8PVA5SS4 0.3GT	9671±1575	15646±1302	10618±6487

Appendix D The biotechnological test of cross-linked silk sericin/PVA/clay aerogel

The in *vitro* direct contact test and MTT assay were repeated using the human gingival fibroblast cell from second human donor to confirm the possibility to use silk sericin/PVA/clay aerogel as 3D scaffold for tissue engineering

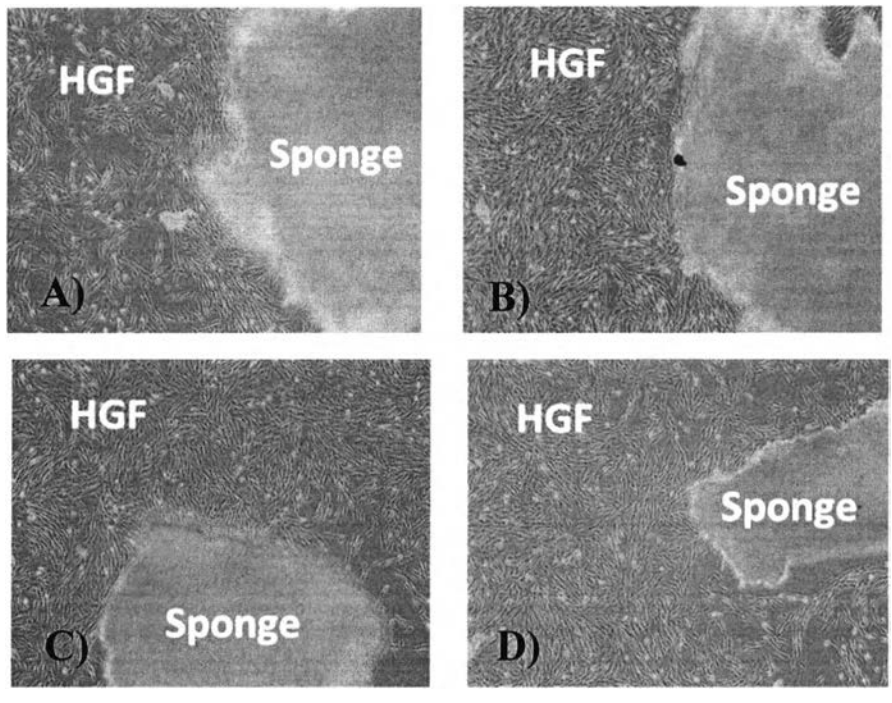

Figure D1 Optical photograph were taken by inverted phase contrast microscope presented the interaction between HGF and sponge with different silk sericin contents 72 hr of second human donor; A) C6PVA5SS1 0.3GT, B) C6PVA5SS2 0.3GT, C) C6PVA5SS3 0.3GT, D) C6PVA5SS4 0.3GT.

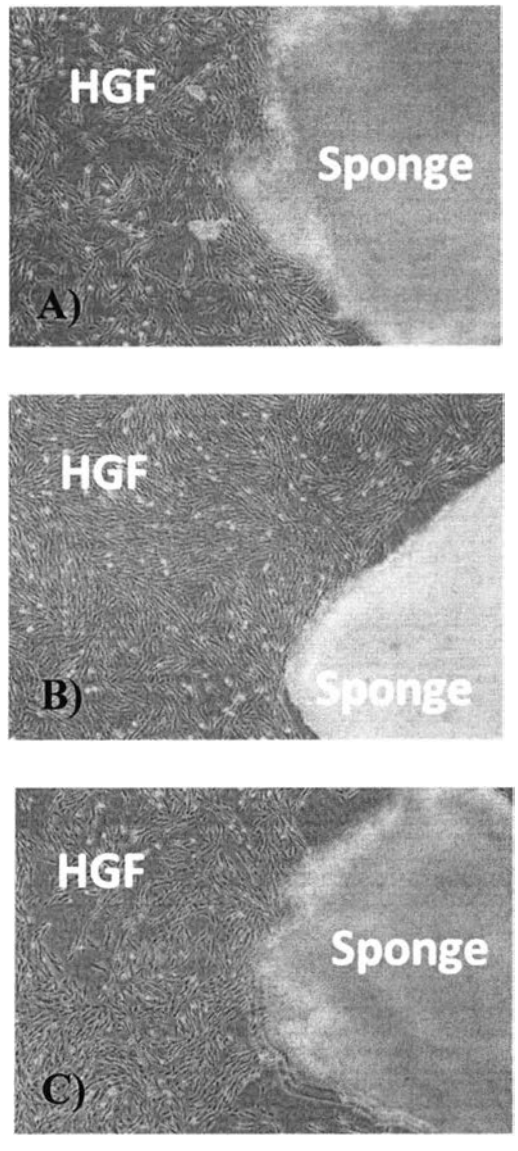

Figure D2 Optical photographs were taken by inverted phase contrast microscope presented the interaction between HGF and sponge with different glutaraldehyde concentration in 72 hr of second human donor; A) C6PVA5SS1 0.3GT, B) C6PVA5SS1 0.5GT, C) C6PVA5SS1 0.7GT

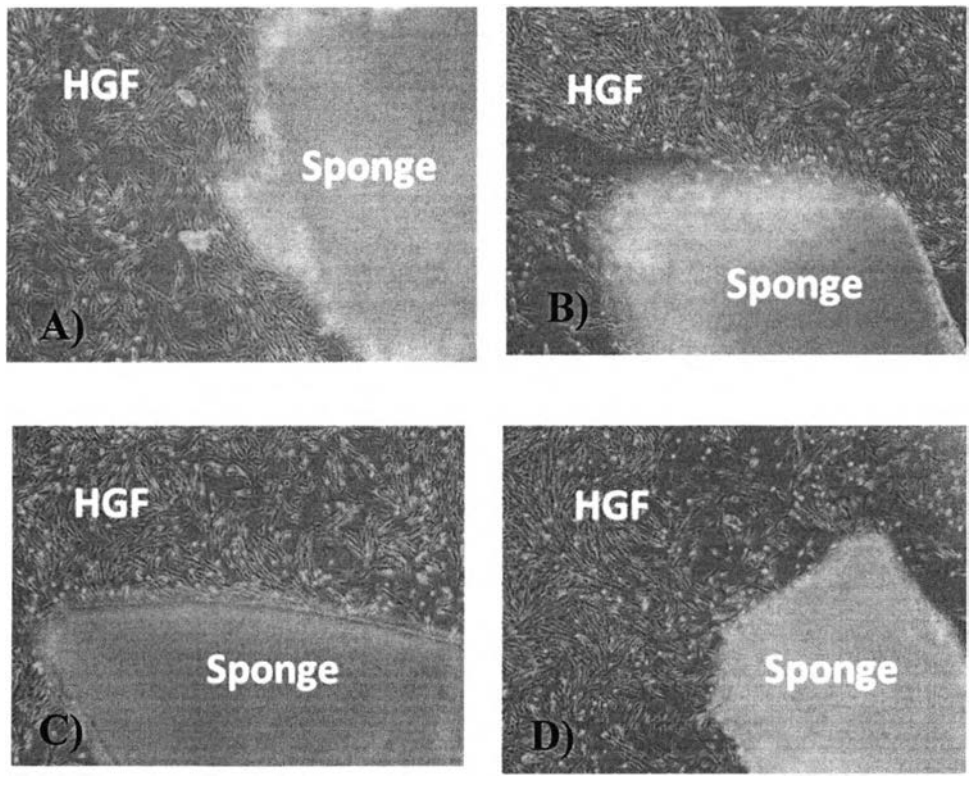

Figure D3 Optical photographs were taken by inverted phase contrast microscope presented the interaction between HGF and sponge with different species of Thai silk cocoon at the composition of C6PVA5SS1 0.3GT in 72 hr of second human donor; A) Nang Noi species at 72 hr., B) Nang Lai at 72 hr., C) Dok Bua species at 72 hr., D) Luang Pairote species at 72 hr.

Table D4 The optical density obtained from MTT assay of the second human volunteer as a function of different content, species of silk sericin and concentration of glutaraldehyde

Sample	OD1	OD2	OD3	Avg. OD	Ratio of Avg.OD/ Control OD
Species					
C6PVA5SS1 0.3GT (NN)	1.314	1.256	1.407	1.326	1.11
Control	1.242	1.169	1.159	1.190	1
C6PVA5SS1 0.3GT (NL)	1.175	1.354	1.382	1.304	1.065
C6PVA5SS1 0.3GT (DB)	1.336	1.152	1.357	1.282	1.05
C6PVA5SS1 0.3GT (LP)	1.284	1.301	1.354	1.313	1.07
Control	1.285	1.190	1.197	1.224	1
Glutaraldehyde concentration					
C6PVA5SS1 0.3GT (NN)	1.314	1.256	1.407	1.326	1.11
C6PVA5SS1 0.5 GT (NN)	1.354	1.410	1.378	1.381	1.16
C6PVA5SS1 0.7 GT (NN)	1.347	1.346	1.305	1.333	1.12
Control	1.242	1.169	1.159	1.190	1
Silk sericin content					
C6PVA5SS1 0.3GT (NN)	1.314	1.256	1.407	1.326	1.11
Control	1.242	1.169	1.159	1.190	1
C6PVA5SS2 0.3GT (NN)	1.205	1.316	1.378	1.300	1.09
C6PVA5SS3 0.3GT (NN)	1.274	1.294	1.330	1.300	1.09
C6PVA5SS4 0.3GT (NN)	1.259	1.261	1.306	1.275	1.07
Control	1.243	1.141	1.191	1.192	1

Appendix E Density of cross-linked silk sericin/PVA/clay aerogel

Table E1 The density of silk sericin/PVA/clay aerogel

Samples	Density (g/cm^3)
C2PVA5SS1 0.7GT	0.116±0.007
C4PVA5SS1 0.7GT	0.115±0.009
C6PVA5SS1 0.7GT	0.133±0.006
C8PVA5SS1 0.7GT	0.103±0.008
C6PVA5SS2 0.7GT	0.133±0.015
C6PVA5SS3 0.7GT	0.134±0.004
C6PVA5SS4 0.7GT	0.144±0.002

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Proceedings:

1. Likitamporn, S.; and Maharaphan, R. (2013, April 23) Influence of Clay Loading on the Properties of Biodegradable Scaffold Silk-Sericin/Poly(vinyl alcohol)/Clay Aerogels. Proceeding of the 4th Research Symposium on Petrochemical and Materials Technology and the 19th PPC Symposium on Petroleum, Petrochemical, and Polymers, Ballroom, Queen Sirikit National Convention Center, Bangkok, Thailand.

Presentations:

1. Likitamporn, S.; and Magaraphan, R. (2012, December 11-15) The Study of Silk Sericin/Clay/Aerogel Structure. Paper presented at the Polymer Processing Society 28th Annual Meeting, Pattaya, Thailand.
2. Likitamporn, S.; and Magaraphan, R. (2013, March 24-28) Mechanical and Thermal Properties of Sericin/PVA/Bentonite Scaffold: Comparison between Uncross-linked and Cross-linked. Paper presented at the 12th Annual UNESCO-IUPAC Workshop and Conference. Stellenbosch, South Africa.
3. Likitamporn S.; and Magaraphan, R. (2013, April 23) Influence of Clay Loading on the Properties of Biodegradable Scaffold Silk-Sericin/Poly(vinyl alcohol)/Clay Aerogels. Paper presented at the 4th Research Symposium on Petrochemical and Materials Technology and The 19th PPC Symposium on Petroleum, Petrochemical, and Polymers. Bangkok, Thailand.

4. Likitamporn, S.; and Magaraphan, R. (2013, May 21-23) Preparation and Characterization of Silk-Sericin/Clay Aerogel for Biotechnological Application. Paper presented at the 3rd International Symposium Frontiers in Polymer Science. Sitges, Spain.