Supplementary Information (SI) for Materials Advances.

Supplementary data

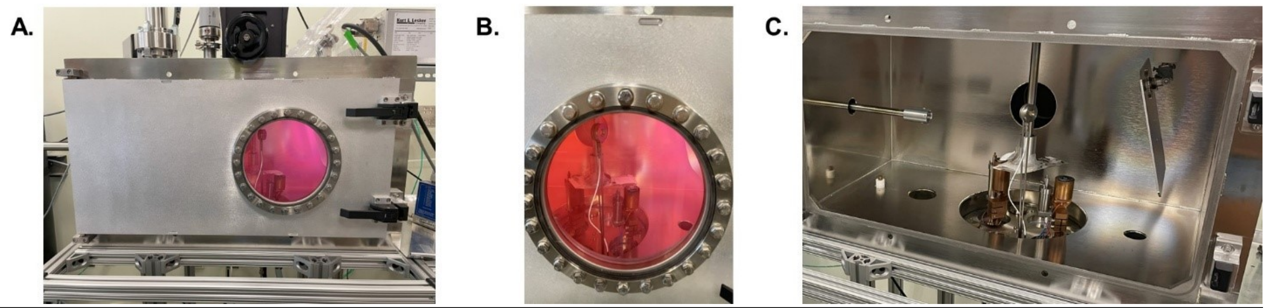

Figure S1. Custom built PECVD chamber demonstrating the tiltable sublimation source and sample holder with the plasma turned 'on'.

Composition of Dipeptide	Amount of peptide (mg)	Argon flow rate (sccm)	Pressure set point (mTorr)	RF power (W)	RF pulsing frequency	Duty cycle	Average RF power** (W)	Temperature	Height (mm)	Time (mins)
FY	4 mg	10 sccm	20 mTorr	30 W	None (continous)	0%	30 W	200 C	4-5 mm	10 mins
FY	4 mg	10 sccm	1.2 mTorr	30 W	1000 Hz	25%	7.5 W	200 C	4-5 mm	10 mins
FY	4 mg	10 sccm	0.225 mTorr	30 W	500 Hz	25%	7.5 W	200 C	4-5 mm	10 mins
WY	4 mg	10 sccm	20 mTorr	30 W	None (continous)	0%	30 W	165 C	4-5 mm	10 mins
WY	4 mg	10 sccm	1.2 mTorr	30 W	1000 Hz	25%	7.5 W	165 C	4-5 mm	10 mins
WY	4 mg	10 sccm	0.225 mTorr	30 W	500 Hz	25%	7.5 W	165 C	4-5 mm	10 mins
YY	4 mg	10 sccm	20 mTorr	30 W	None (continous)	0%	30 W	165 C	4-5 mm	10 mins
YY	4 mg	10 sccm	1.2 mTorr	30 W	1000 Hz	25%	7.5 W	165 C	4-5 mm	10 mins
YY	4 mg	10 sccm	0.225 mTorr	30 W	500 Hz	25%	7.5 W	165 C	4-5 mm	10 mins

Table S1. Conditions of deposition used for the dipeptide in this study. ** The average power was calculated as 7.5 W using standard RF power equations (using constant power and duty cycle) applied during the pulsed plasma conditions.

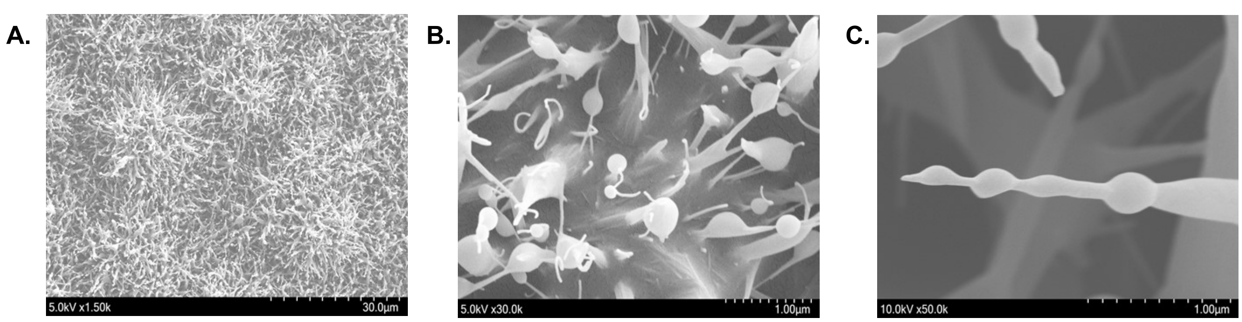

Figure S2. SEM micrographs indicate the deformation of the deposited nanostructures due to excessive heating (20 °C) above the glass-liquid phase transition temperature during the PECVD deposition.

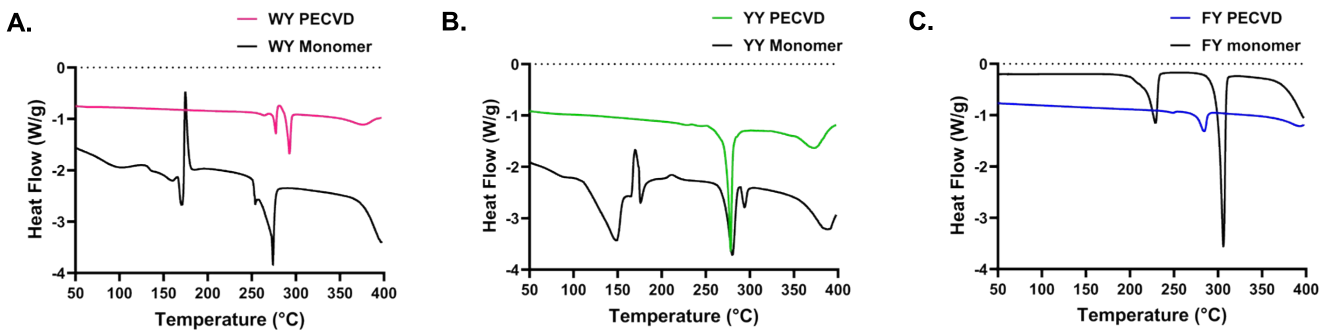

Figure S3. DSC graphs of the PECVD deposited nanostructures of the dipeptide monomers. A. Tryptophan-tyrosine; B. Dityrosine and C. Phenylalanine-tyrosine.

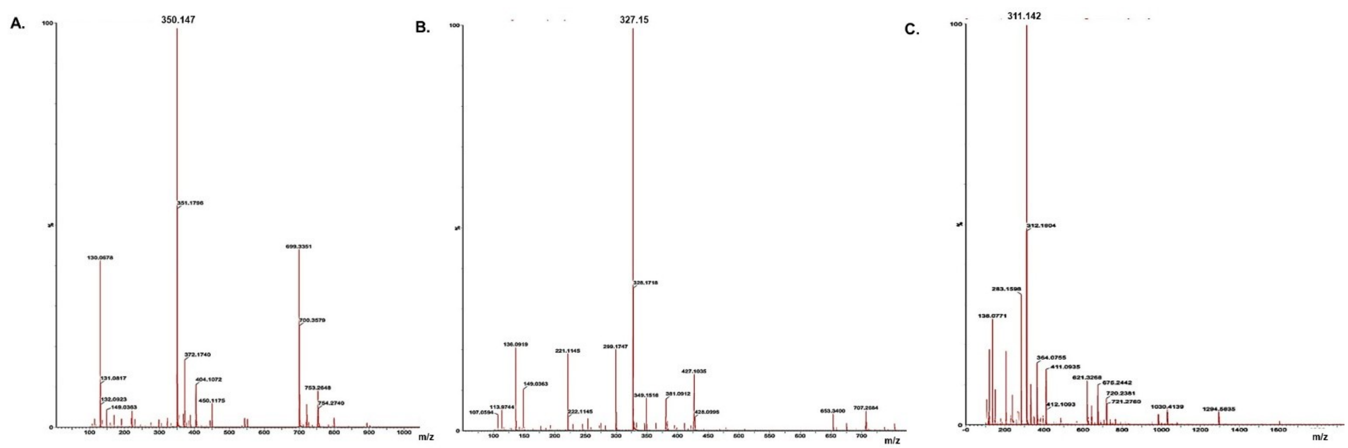

Figure S4. LC-MS chromatograms of dipeptides deposited via PECVD indicating a loss of a water molecule (~18.015 g/mol). (A). WY (B). YY and (C). FY. The MW of the dipeptide monomers obtained from Bachem are 367.4 g/mol for WY, 344.37 g/mol for YY and 328.37 g/mol for FY respectively.

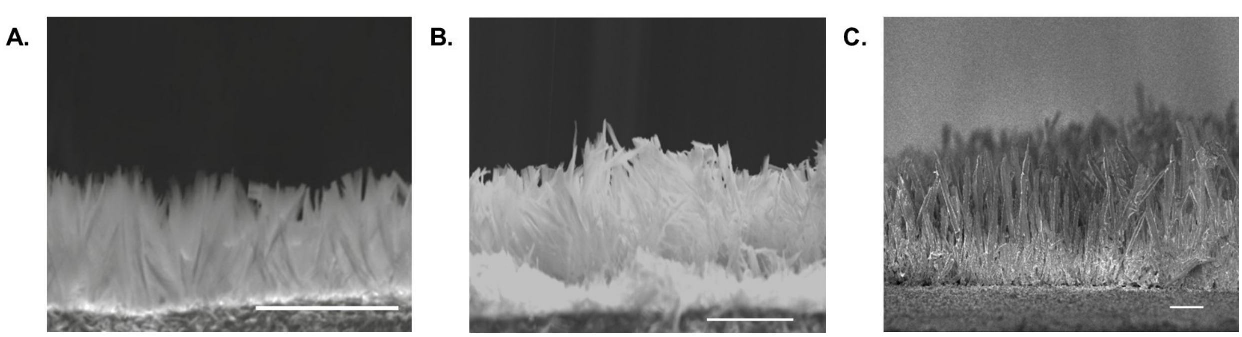

Figure S5. SEM imaging of the cross-section of WY dipeptides deposited via PECVD at different time points indicating increasing length of the nanostructures deposited. (A). 5 mins (B). 10 mins and (C). 15 mins. * Scale bar is 25 μm

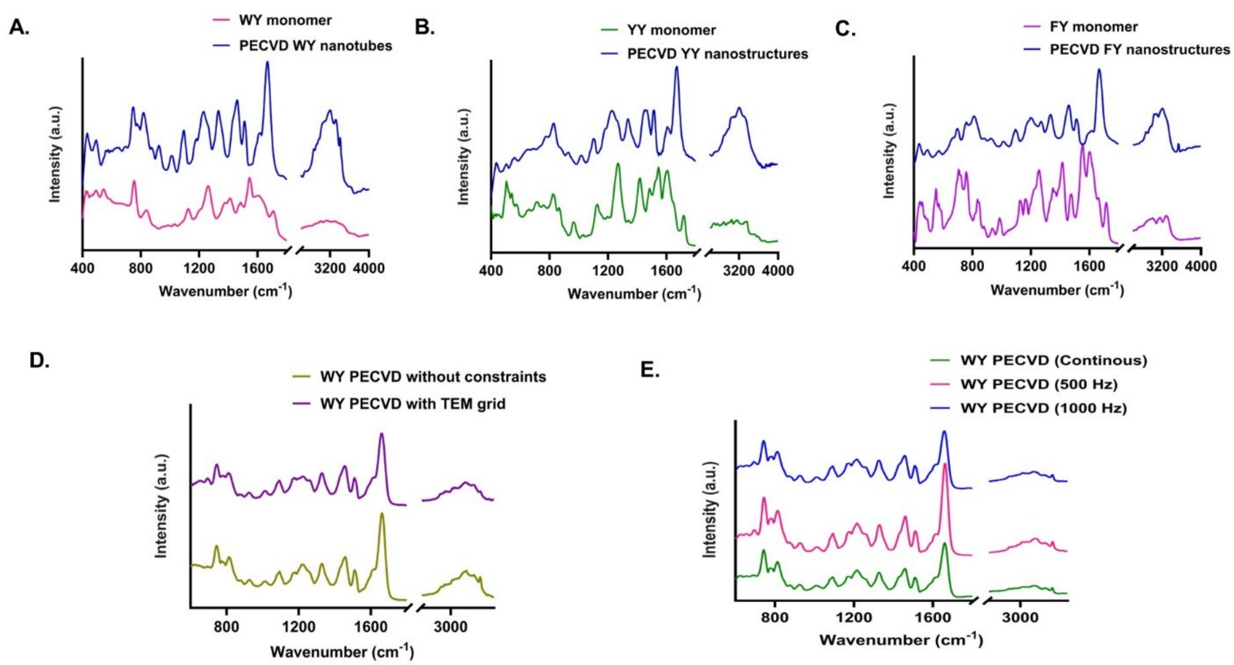

Figure S6. FTIR spectra of PECVD deposited nanostructures in comparison with the dipeptide monomers WY (A), YY (B), FY (C) and deposited nanostructures with different conditions (WY as the model peptide) with physical constraints (D) and different plasma pulsation frequencies (E).

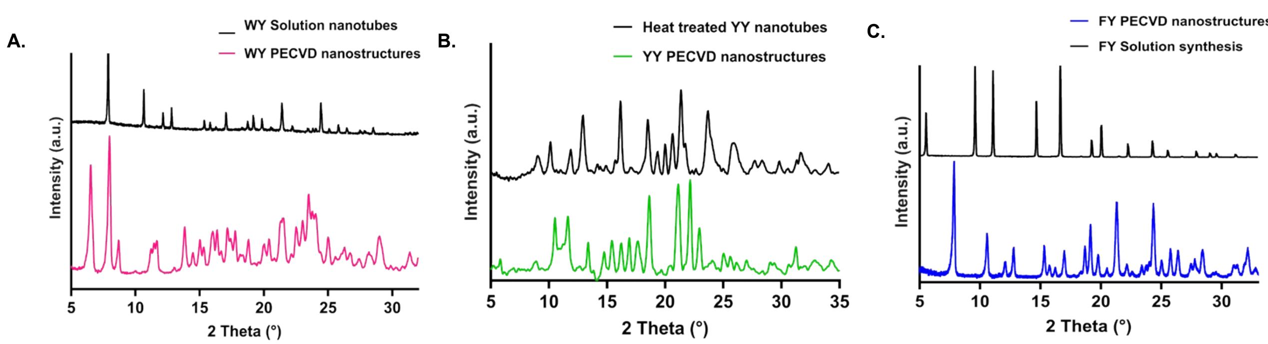

Figure S7. XRD analysis of PECVD nanostructures in comparison to the solution synthesized nanotubes. WY (A), YY (B) and FY (C).

NMR

YY-MONOMER

^{1}H NMR (400 MHz, DMSO-d_6) δ 8.19 (s, 1H, N*H*), 7.02 - 6.65 (dd, *J* = 23.4, 8.4 Hz, 8H, Ar*H*), 4.31 (d, *J* = 6.2 Hz, 1H, C*H*), 3.53 (d, *J* = 4.3 Hz, 1H, C*H*), 2.98 – 2.53 (m, 4H, CH_2).

YY-PECVD NT

^{1}H NMR (400 MHz, DMSO-d_6) δ 9.22 (d, *J* = 5.0 Hz, 2H, O*H*), 7.77 (d, *J* = 2.7 Hz, 2H, N*H*), 6.93 - 6.59 (m, (m, 8H, Ar*H*)), 3.86 (ddd, *J* = 6.9, 4.7, 2.7 Hz, 2H, C*H*), 2.90 - 2.58 (m, 2H, CH_2), 2.11 (dd, *J* = 13.7, 6.6 Hz, 2H, CH_2).

WY-MONOMER

^1H NMR (400 MHz, DMSO-d_6) δ 10.96 (d, *J* = 2.4 Hz, 1H, O*H*), 8.33 (s, 1H, Indole N*H*), 7.63 – 6.55 (m, 9H, Ar*H*), 4.34 (d, *J* = 6.0 Hz, 1H, C*H*), 3.69 (dd, *J* = 8.3, 4.4 Hz, 1H, C*H*), 3.15 (dd, *J* = 14.6, 4.3 Hz, 1H, CH_2), 2.98 – 2.78 (m, 3H, CH_2).

WY-PECVD NT

^1H NMR (400 MHz, DMSO-d_6) δ 10.89 (d, *J* = 2.4 Hz, 1H, O*H*), 9.15 (s, 1H, Indole N*H*), 7.82 (d, *J* = 2.6 Hz, 1H, N*H*), 7.63 (d, *J* = 2.7 Hz, 1H, N*H*), 7.48 - 6.49 (m, 9H, Ar*H*), 3.97 – 3.91 (m, 1H, C*H*), 3.81 – 3.74 (m, 1H, C*H*), 2.80 (dd, *J* = 14.4, 4.3 Hz, 1H, CH_2), 2.48 – 2.36 (m, 2H, CH_2), 1.81 (dd, *J* = 13.6, 7.0 Hz, 1H, CH_2).

FY MONOMER

^1H NMR (400 MHz, DMSO-d_6) δ 8.16 (d, J = 7.7 Hz, 1H, N*H*), 7.31 – 7.17 (m, 5H, Ar*H*), 6.91 (d, J = 8.5 Hz, 2H, Ar*H*), 6.62 (d, J = 8.4 Hz, 2H, Ar*H*), 4.34 (d, J = 5.9 Hz, 1H, C*H*), 3.52 (dd, J = 8.4, 4.5 Hz, 1H, C*H*), 3.00 – 2.64 (m, 4H, CH_2).

FY PECVD NT

^1H NMR (400 MHz, DMSO-d_6) δ 9.21 (s, 1H, O*H*), 7.85 (s, 2H, N*H*), 7.34 – 6.60 (m, 9H, Ar*H*), 3.91 (d, *J* = 22.0 Hz, 2H, C*H*), 2.24 – 2.13 (m, 4H, C*H*).