Electronic Supplementary Information: Coordination Number Model to Quantify Packing Morphology of Aligned Nanowire Arrays

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Table S1 Triangle areas, and volume fractions for all coordinations.

N	$A_{\triangle,\,N}(P_N)$	$V_{f,\,N}(D,P_N)$
3	$\frac{\sqrt{3}}{4}P_N^2$	$\frac{\sqrt{3}\pi}{6}\left(\frac{D}{P_N}\right)^2$
4	$\frac{1}{4}P_N^2$	$\frac{\pi}{4}\left(\frac{D}{P_N}\right)^2$
5	$cos\left(\frac{3\pi}{10}\right)sin\left(\frac{3\pi}{10}\right)P_N^2$	$\frac{\pi}{8cos\left(\frac{3\pi}{10}\right)sin\left(\frac{3\pi}{10}\right)}\left(\frac{D}{P_N}\right)^2$
6	$\frac{\sqrt{3}}{4}P_N^2$	$\frac{\sqrt{3}\pi}{6}\left(\frac{D}{P_N}\right)^2$

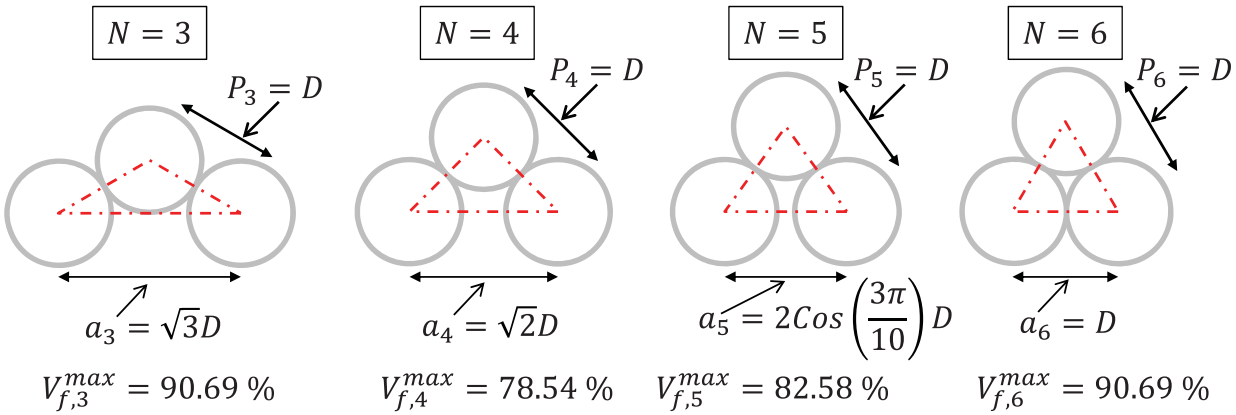

Fig. S1 Illustration of component triangles for each coordination at the maximum theoretical volume fractions (wire walls are touching). Since the unit cell inter-wire spacing, S_N, is zero in this case, P_N, is equal to the wire diameter, D, in all coordinations.

Table S2 Lattice constant, Chi parameter, and average inter-wire spacing for all coordinations.

N	$a_N(D,V_f)$	χ_N	$\Gamma_N(D,V_f)$
3	$\sqrt{3}D\left(\sqrt{\frac{V_{f,3}^{max}}{V_f}}\right)$	$\sqrt{3}$	$D\left(\left(\frac{\sqrt{3}+1}{2}\right)\left(\sqrt{\frac{V_{f,3}^{max}}{V_f}}\right)-1\right)$
4	$\sqrt{2}D\left(\sqrt{\frac{V_{f,4}^{max}}{V_f}}\right)$	$\sqrt{2}$	$D\left(\left(\frac{\sqrt{2}+1}{2}\right)\left(\sqrt{\frac{V_{f,4}^{max}}{V_f}}\right)-1\right)$
5	$2cos\left(\frac{3\pi}{10}\right)D\left(\sqrt{\frac{V_{f,3}^{max}}{V_f}}\right)$	$2cos\left(\frac{3\pi}{10}\right)$	$D\left(\left(\frac{2cos\left(\frac{3\pi}{10}\right)+1}{2}\right)\left(\sqrt{\frac{V_{f,3}^{max}}{V_f}}\right)-1\right)$
6	$D\left(\sqrt{\frac{V_{f,6}^{max}}{V_f}}\right)$	1	$D\left(\sqrt{\frac{V_{f,6}^{max}}{V_f}}-1\right)$

Table S3 Deviation factor for all coordinations.

N	$\delta_N(D,V_f)$
3	$\left(\frac{\sqrt{3}+1}{2}\right)$
4	$\sqrt{\frac{\sqrt{3}}{2}}\left(\frac{\sqrt{2}+1}{2}\right)$
5	$\sqrt{\frac{\sqrt{3}}{4cos\left(\frac{3\pi}{10}\right)sin\left(\frac{3\pi}{10}\right)}}\left(\frac{2cos\left(\frac{3\pi}{10}\right)+1}{2}\right)$
6	1

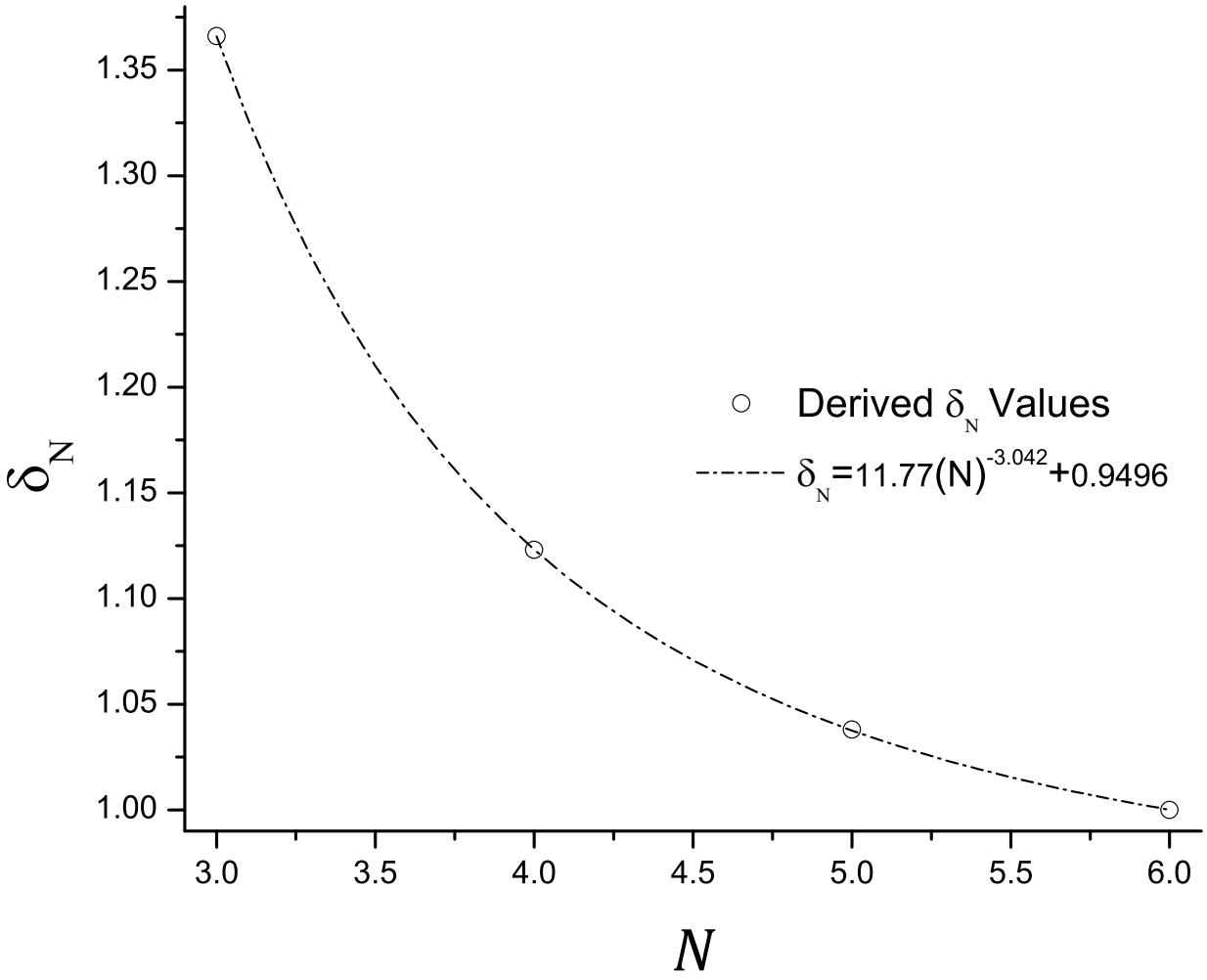

Fig. S2 Plot of the deviation factor from hexagonal packing, δ_N, as a function of nanowire coordination number, N, using the functional form given in Eq. 8.

Final form of the average inter-wire spacing equation for $3 \leq N \leq 6$:

$$\Gamma_N(D,V_f) = D\left((11.77(N)^{-3.042} + 0.9496)\sqrt{\frac{0.9069}{V_f}} - 1\right) \tag{S1}$$

Correction equation for average inter-wire spacings extracted from HRSEM micrographs:

$$\Gamma_N(D,V_f) = \frac{\Gamma_N^{SEM}}{Cos\left(ArcTan\left(\frac{\ell_e^{SE}}{\Gamma_N^{SEM}}\right)\right)} \tag{S2}$$

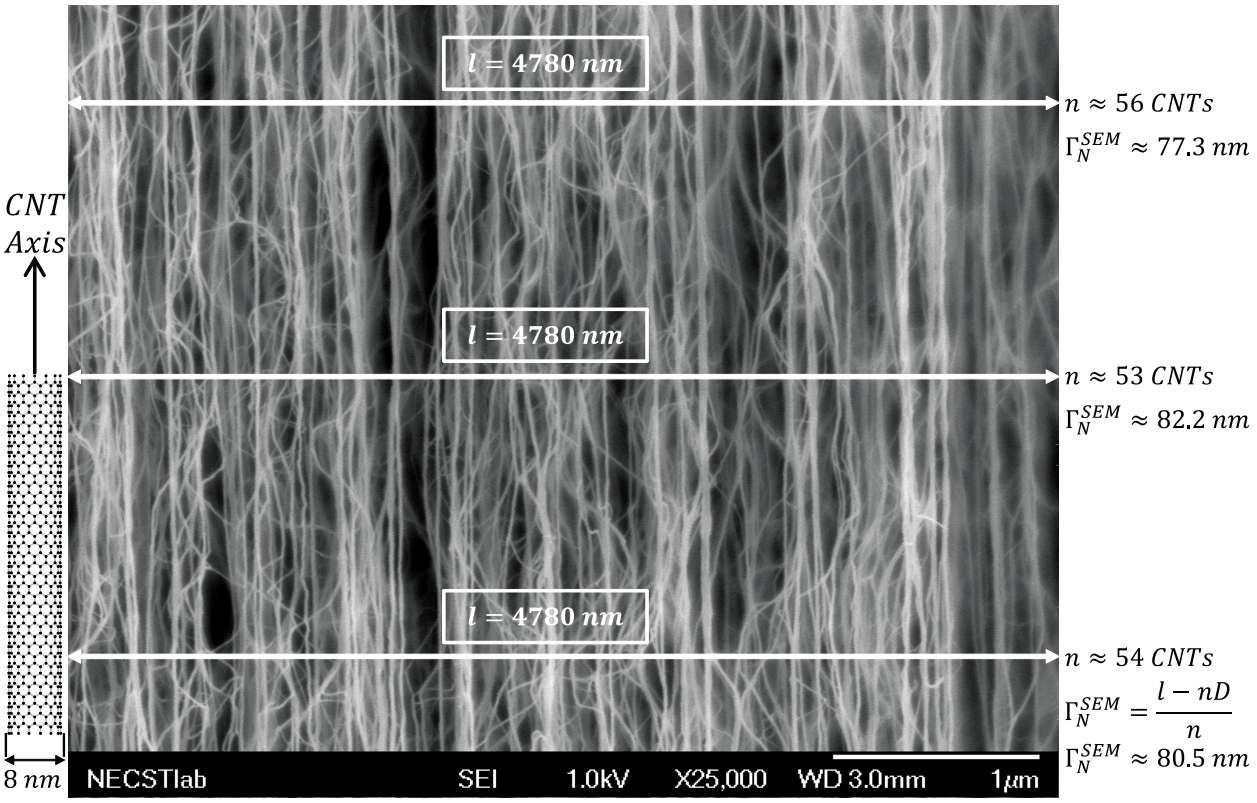

Fig. S3 HRSEM micrograph for a 1.0 volume % CNT forest with lines drawn perpendicular to the CNT primary axis. The average inter-CNT spacing in the forest was then determined by counting only the bright in-focus CNTs underneath each line.