Supplementary Information (SI) for Nanoscale.

Supplementary Information

Predictive Modeling of Optical and Electrical Coupling in Silver Nanowire Networks for Stretchable Transparent Electrodes

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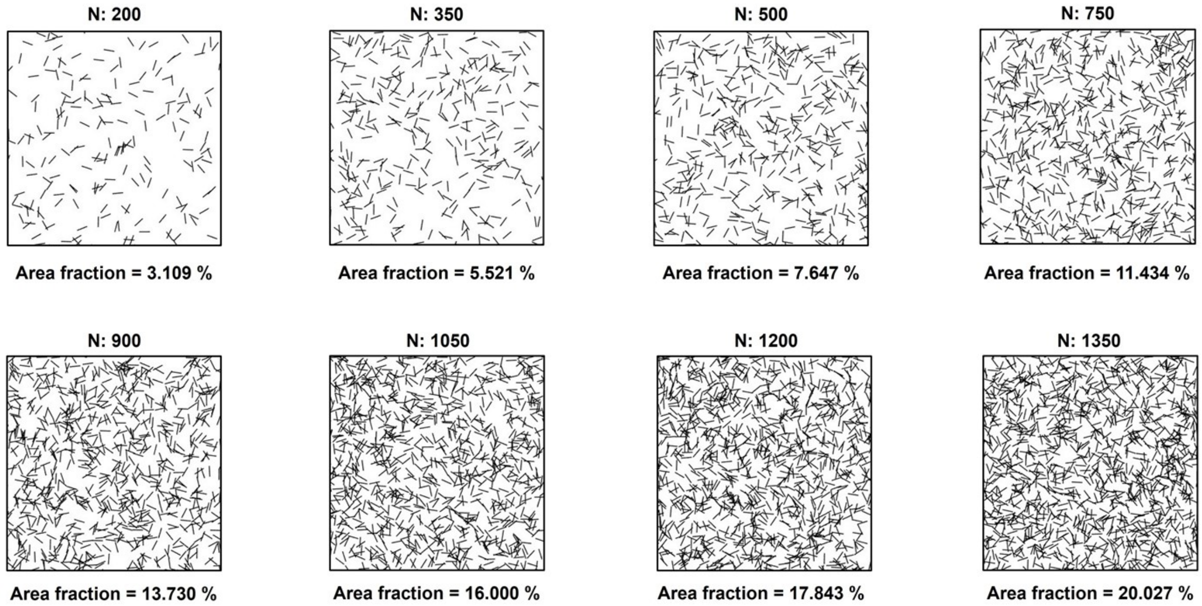

Fig. S1 Simulation results of randomly distributed nanowires within a normalized square domain based on the Monte-Carlo method, along with the calculated area fraction. The total number of nanowires in the system is denoted as N, and the nanowire length is defined as 0.05 times the normalized side length of the system.

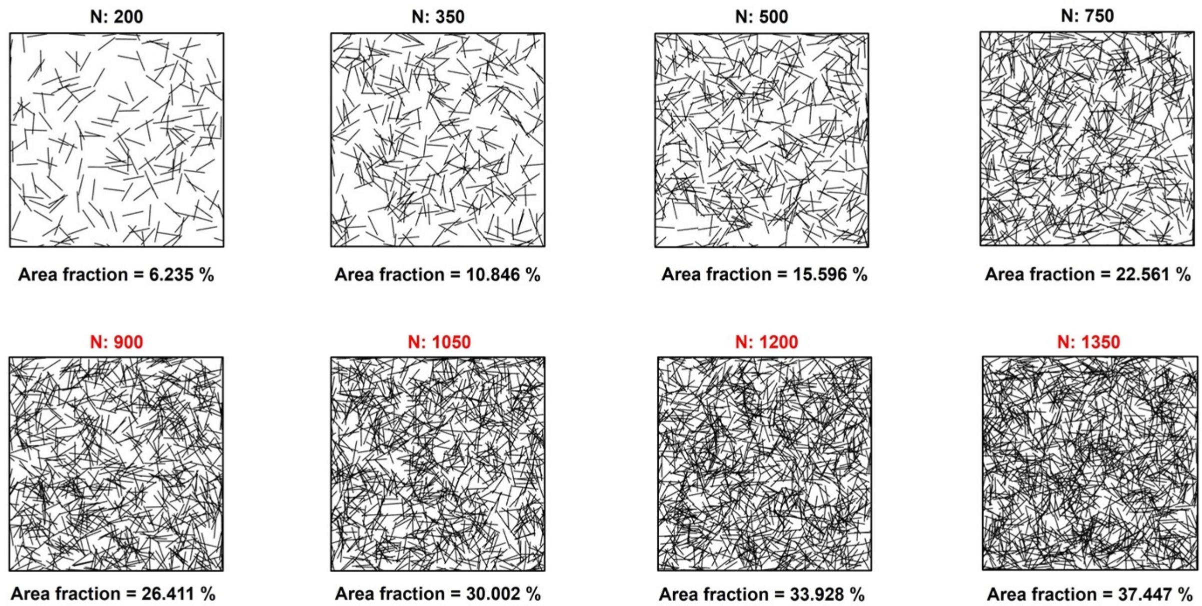

Fig. S2 Simulation results of randomly distributed nanowires within a normalized square domain based on the Monte-Carlo method, along with the calculated area fraction. The total number of nanowires in the system is denoted as N, and the nanowire length is defined as 0.10 times the normalized side length of the system. The condition N, where the percolation network is formed, is indicated by the red color.

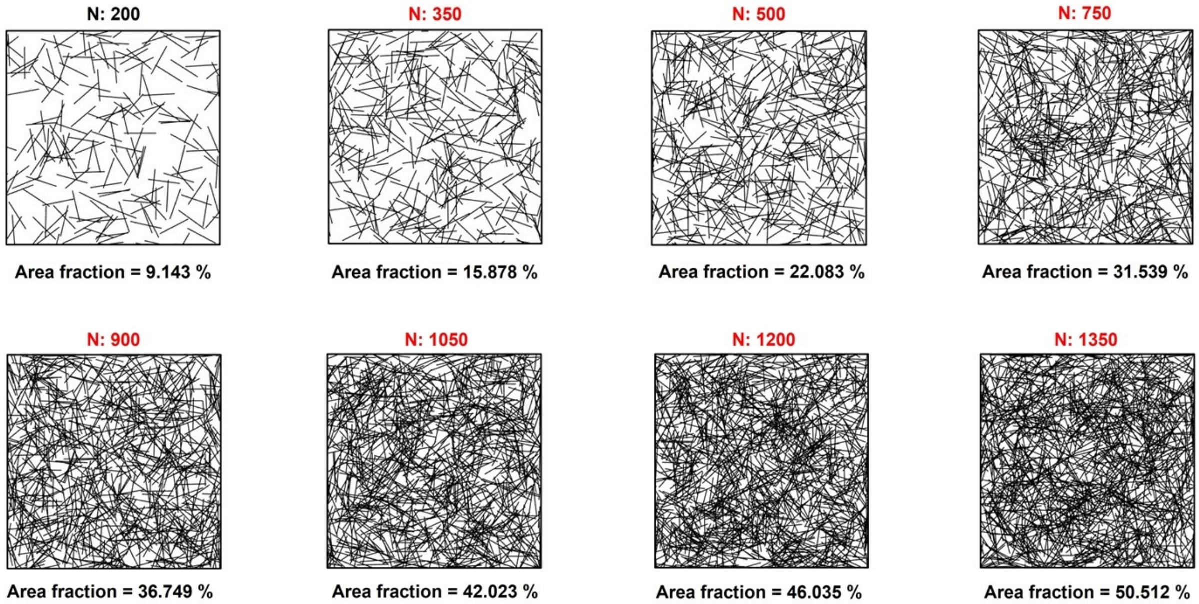

Fig. S3 Simulation results of randomly distributed nanowires within a normalized square domain based on the Monte-Carlo method, along with the calculated area fraction. The total number of nanowires in the system is denoted as N, and the nanowire length is defined as 0.15 times the normalized side length of the system. The condition N, where the percolation network is formed, is indicated by the red color.

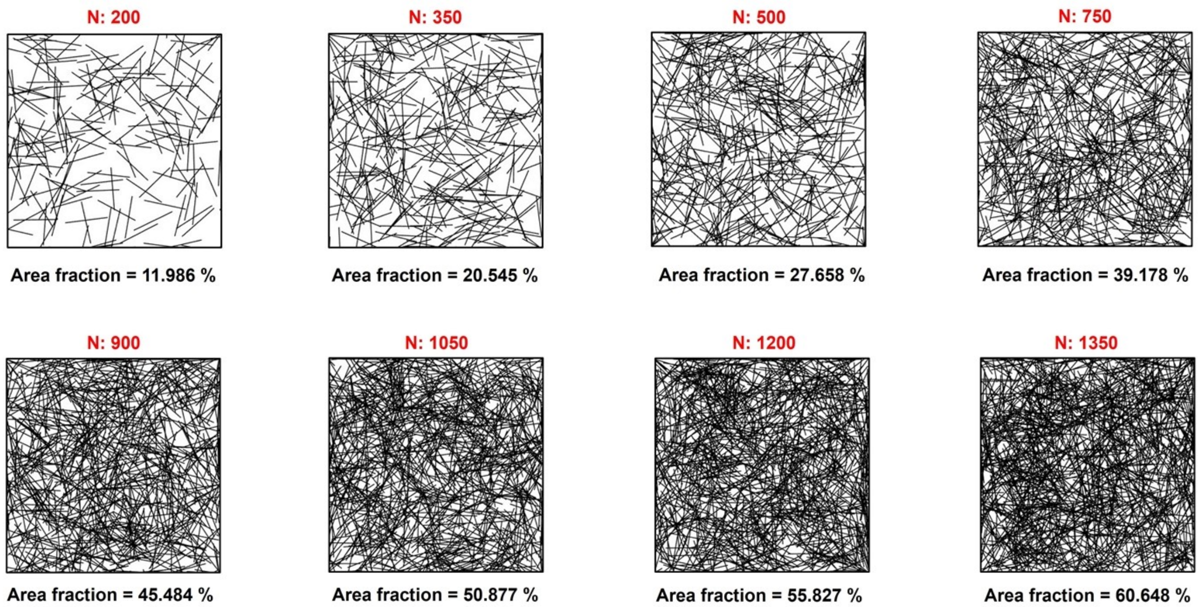

Fig. S4 Simulation results of randomly distributed nanowires within a normalized square domain based on the Monte-Carlo method, along with the calculated area fraction. The total number of nanowires in the system is denoted as N, and the nanowire length is defined as 0.20 times the normalized side length of the system. The condition N, where the percolation network is formed, is indicated by the red color.

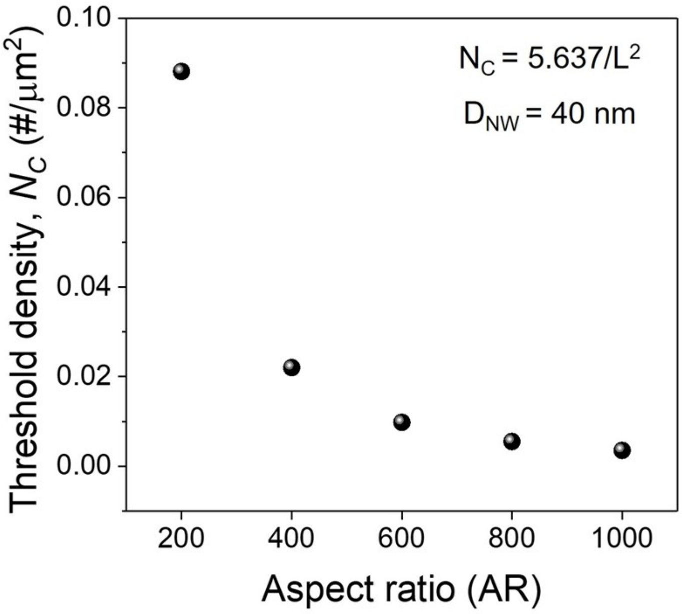

Fig. S5 The calculated relationship between N_C and the nanowire aspect ratio. To ensure that the aspect ratio was diversified solely by the length variable, the nanowire diameter was fixed at 40 nm.

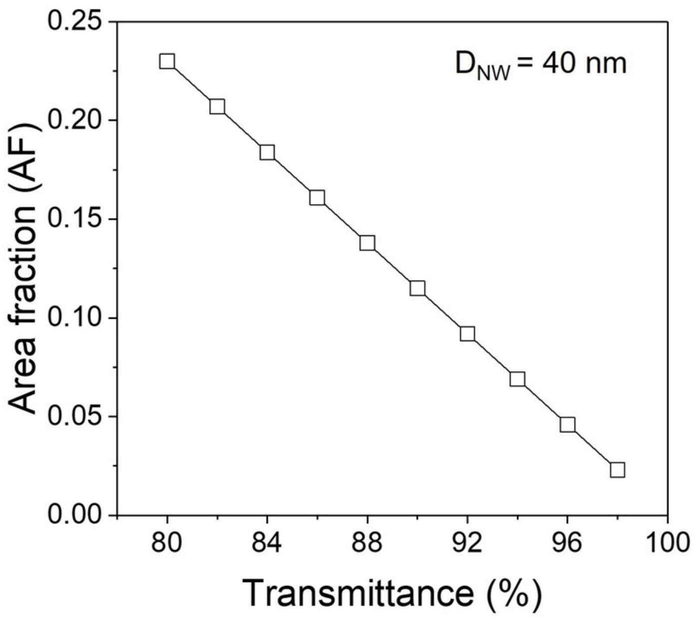

Fig. S6 The relationship between optical transmittance and area fraction in a randomly distributed network of 40 nm diameter nanowires.

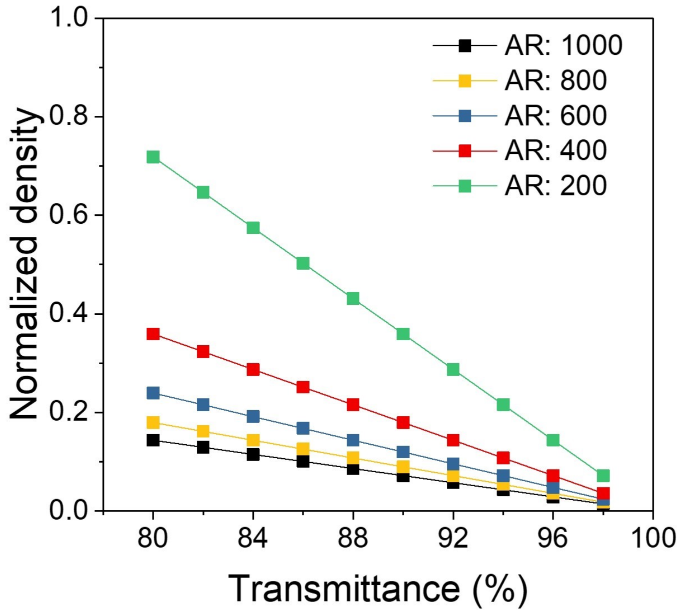

Fig. S7. Relationship between optical transmittance and normalized density under various nanowire aspect ratio conditions. As the transmittance increases, and as the aspect ratio becomes larger at a given transmittance level, the normalized density projected within the system decreases.

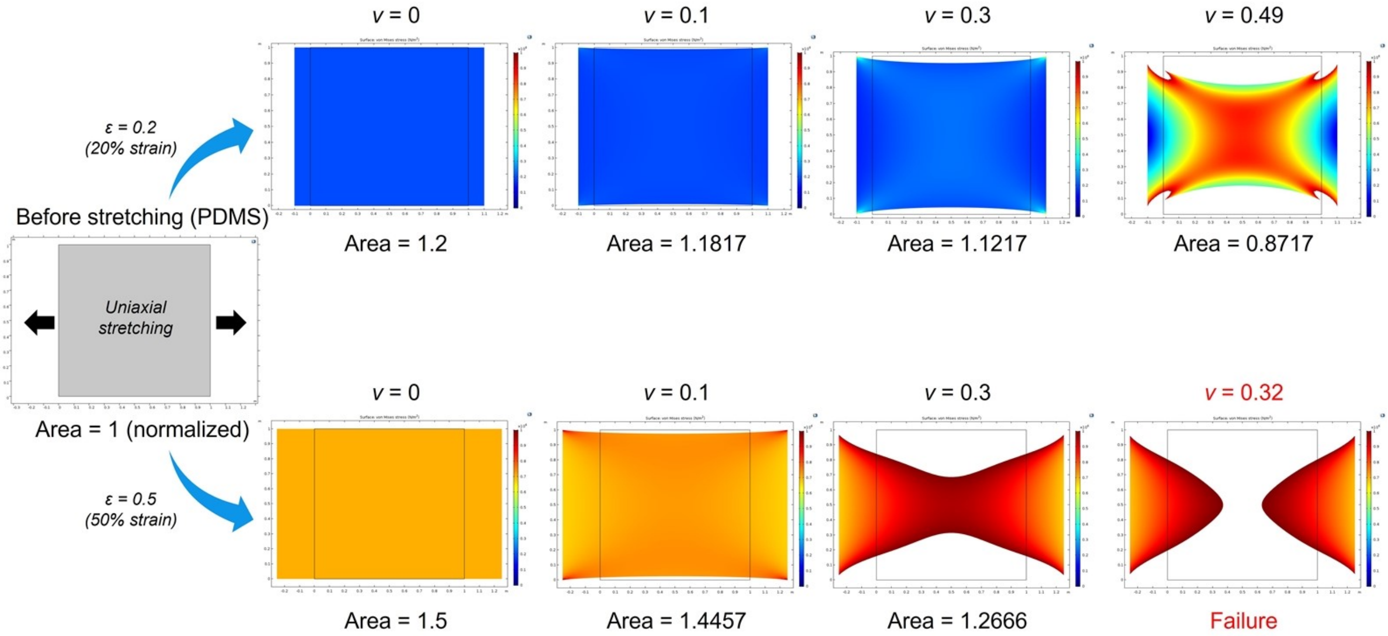

Fig. S8. COMSOL 2D stretching simulation of the square PDMS. Each side length of the PDMS substrate was normalized to unity, and the surface area after tensile deformation was evaluated for different Poisson's ratios (v). The density of the PDMS used in the simulation was set to 970 kg/m^3, and the Young's modulus was fixed at 750 kPa. The color bar represents the applied stress distribution.