

### Supplementary information

Table S1. Dimensions of the models.

Model	Line width of batten ( $\mu\text{m}$ )	Spacing of batten ( $\mu\text{m}$ )	Height of batten ( $\mu\text{m}$ )
model-A	250	250	70
model-B	200	130	70
model-C	300	200	70
model-D	200	130	35
model-E	300	200	35
model-F	200	100	35
model-G	500	500	35
model-P	-	-	-

Table S2. Compositions of MCNFs.

Sample name	PU (g)	MWCNTs (g)
MWCNT <sub>0.022</sub> /PU	0.9	0.02
MWCNT <sub>0.032</sub> /PU	0.9	0.03
MWCNT <sub>0.042</sub> /PU	0.9	0.04
MWCNT <sub>0.052</sub> /PU	0.9	0.05

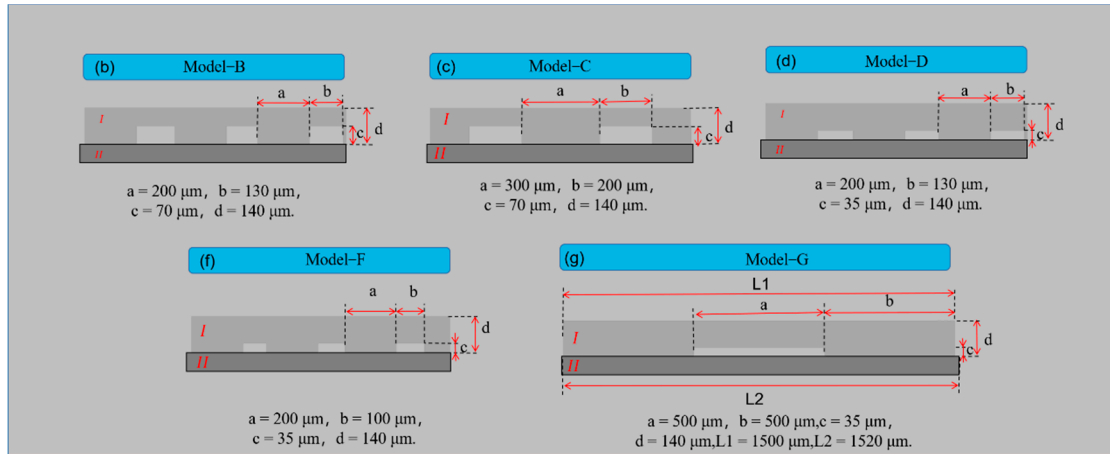


Figure S1. Schematic diagrams of the MCNF in contact with the electrode (Model-B, Model-C, Model-D, Model-F, and Model-G).

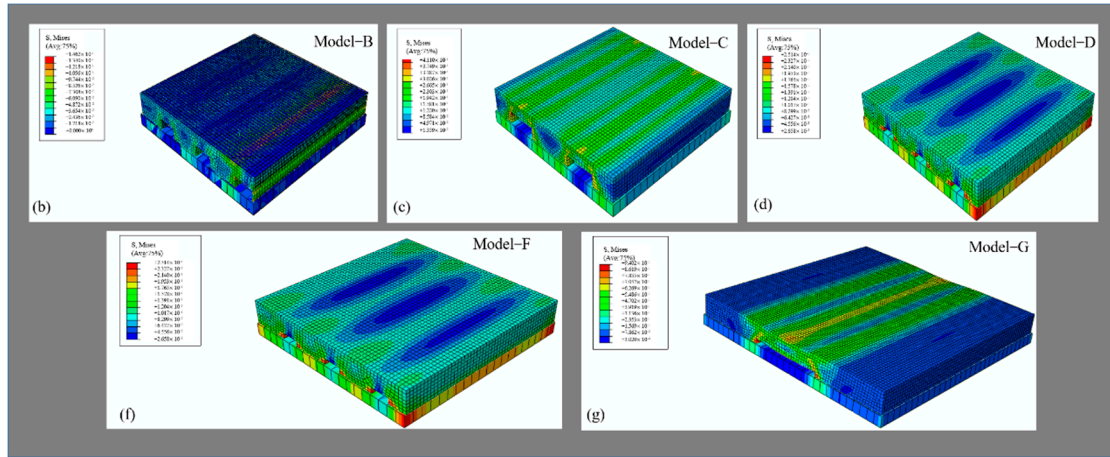


Figure S2. Stress distributions of MCNFs in contact with electrodes of different models (Model-B, -C, -D, -F, and -G).

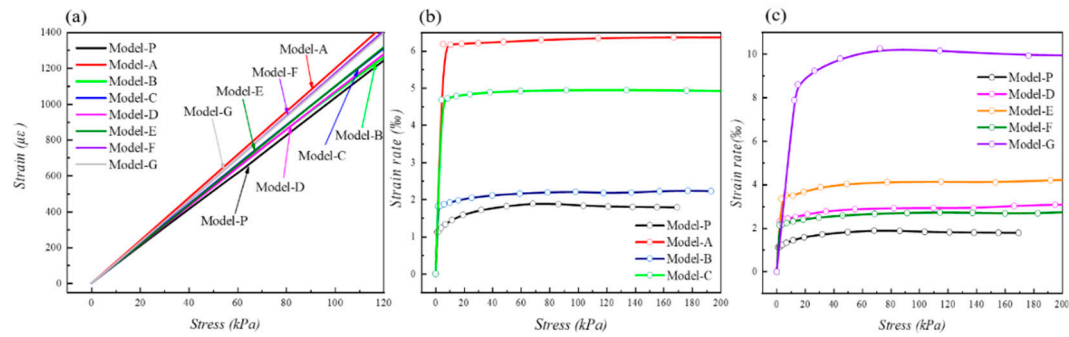


Figure S3. FEM analysis results of MCNFs. (a) Stress–micro-strain curves of finite element Model-P and Model-A through Model-G; (b) Stress–strain rate curves of finite element Model-P and Model-A through Model-C; (c) Stress–strain rate curves of finite element Model-P and Model-D through Model-G.