

Supporting Information

Template Synthesis of Metal Tungsten Nanowire Bundles with High Field Electron Emission Performance

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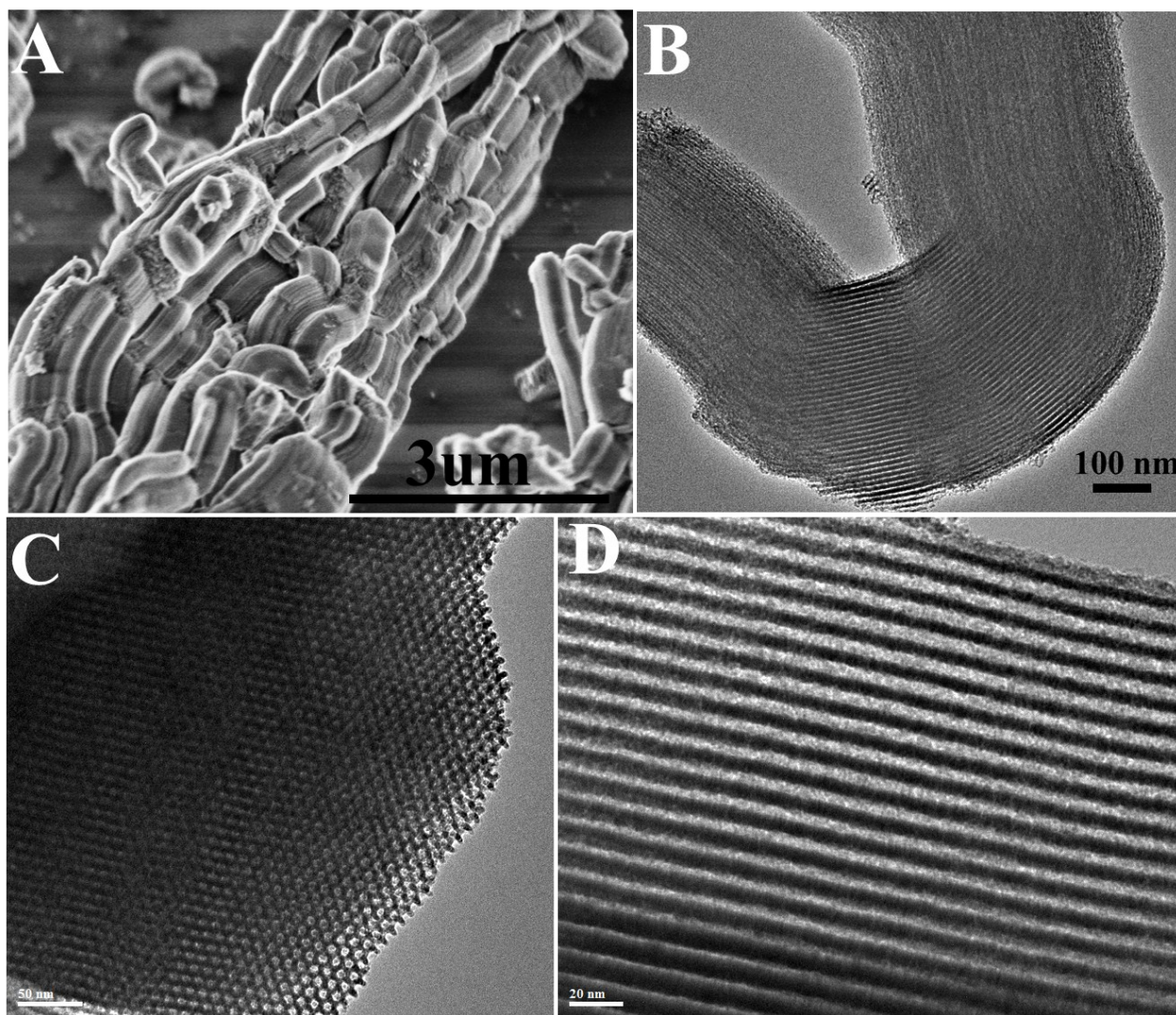


Figure S1. The SEM images (A, B) and TEM images (C, D) of the as-prepared mesoporous silica SBA-15 hard template via a hydrothermal treatment at 130°C for 3 days followed by calcination at 550 °C for 5 h.

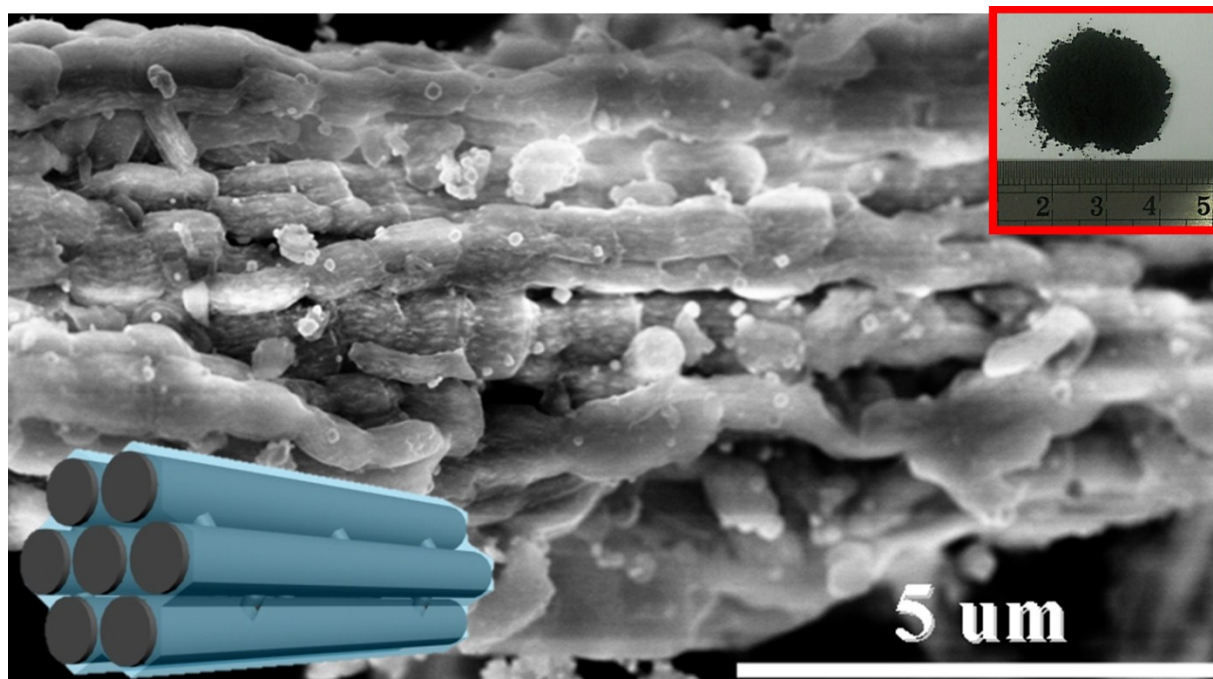


Figure S2. The SEM image of the mesoporous composite W@SBA-15 synthesized via the impregnation of PTA into the mesochannels of the SBA-15 template followed by H₂-reduction at 800 °C for 2 h. Insets are the corresponding structural model (bottom-left corner) and photo picture of the composite W@SBA-15 (top-right corner).

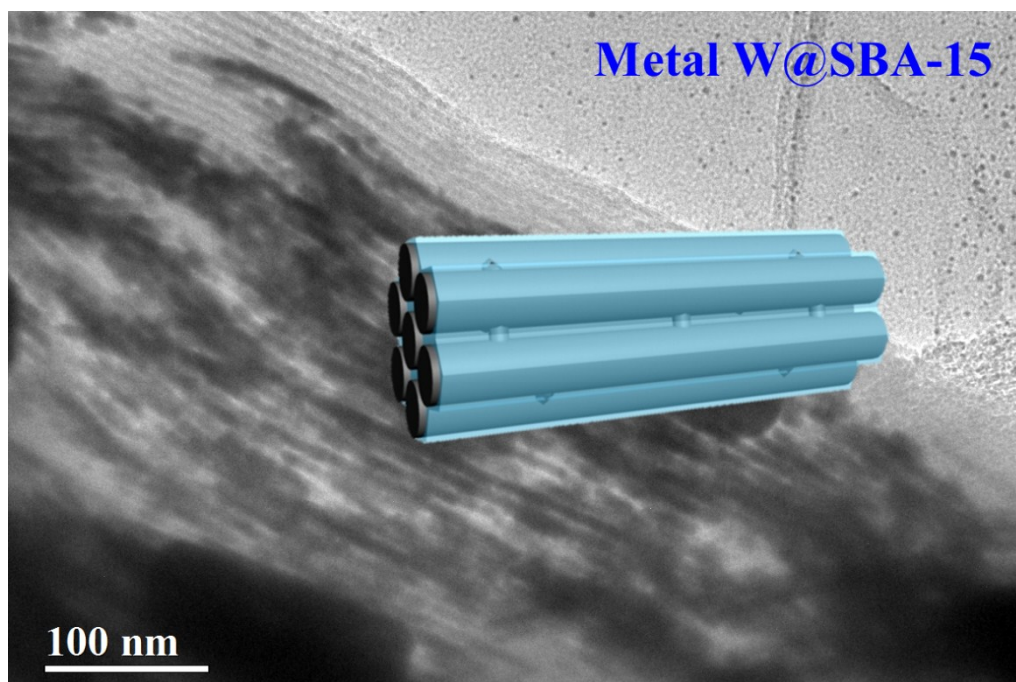


Figure S3. The TEM image of the composite W@SBA-15 synthesized via the impregnation of PTA into the mesochannels of the SBA-15 template followed by H₂-reduction at 800 °C for 2 h. Inset is the corresponding structural model of the composite W@SBA-15.

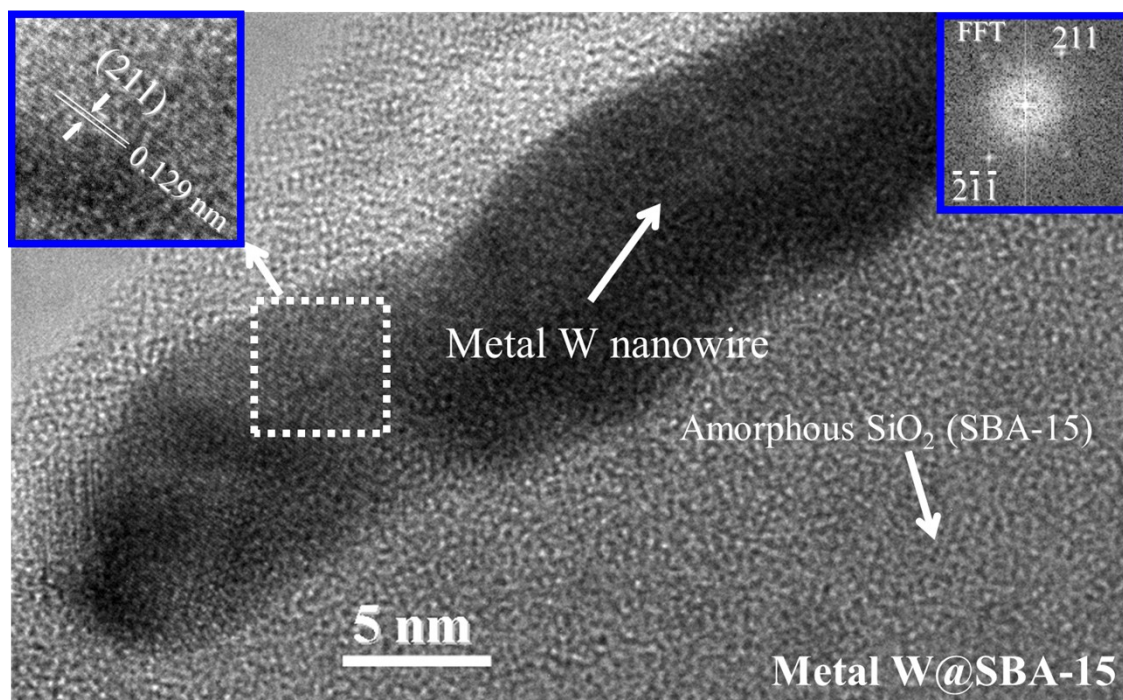


Figure S4. The TEM image of the W@SBA-15 via the impregnation of PTA into the mesochannels of the SBA-15 template followed by H₂-reduction at 800 °C for 2 h. Inset in top-left corner is the HRTEM image recorded in the dotted square area. Inset in top-right corner is the two-dimensional Fourier transform of the HRTEM area remarked in the dotted square area.

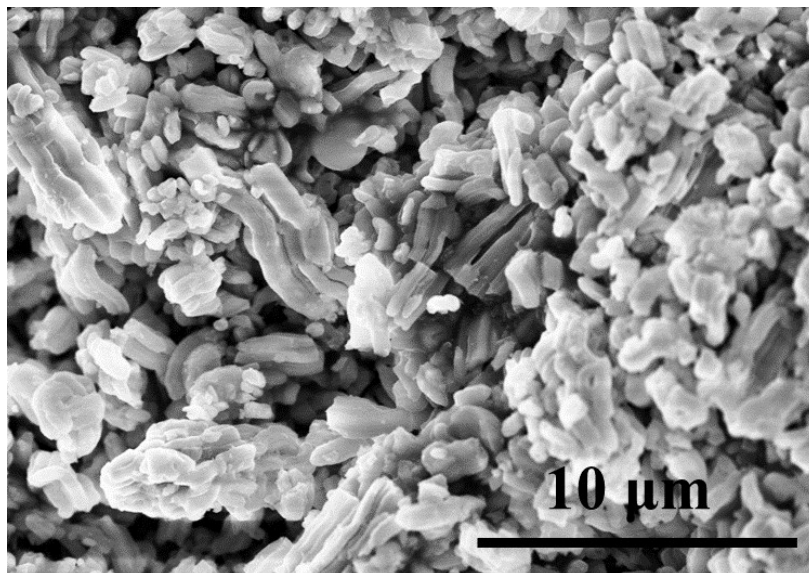


Figure S5. The low magnification SEM image of W nanowire bundles prepared via H_2 gas reduction followed by the removal of SBA-15 template by an HF solution.

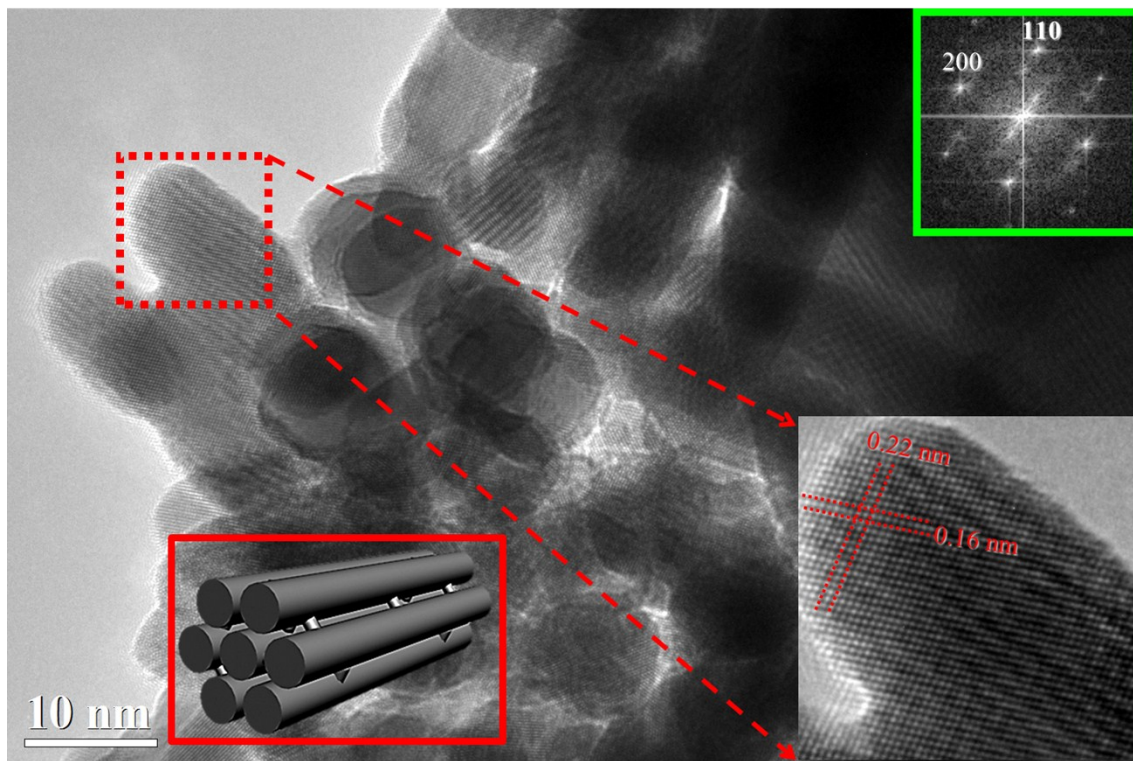


Figure S6. The HRTEM image of the metallic W nanowire bundles obtained after the H_2 -reduction at 800 °C for 2 h followed by the removal of silica SBA-15 in HF solution. The top and bottom right corner insets are the FFT and HRTEM images taken from the dotted square region marked in red, respectively. The bottom-left corner inset is the structural model of the metallic W nanowire bundles.

Table S1. The field-electron emission performance of various W nanostructures

W nanostructures	Turn-on field ($V \mu m^{-1}$)	Field enhancement factor (β)
W nanowires ^[1,2]	5.0	3825
W nanorods ^[3]	8.0	-
W nanothorns ^[4]	6.2	1578
W nanowires (this work)	4.1	3563

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