Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Greatly Enhanced Field Emission of the Novel T-ZnO Supported CNTs Emitters with Simple Spraying Process

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Supporting Information

Captions

Fig.S1 (a) the low-magnification and high magnification SEM images (**inset**) of as-prepared pure T-ZnO nanomaterials sprayed on the substrate with low concentration

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T-ZnO precursor solution (5mg T-ZnO: 100ml isopropanol solution); **(b)** the low-magnification and high magnification SEM images (**inset**) of as-prepared pure T-ZnO nanomaterials sprayed on the substrate with high concentration T-ZnO precursor solution (8mg T-ZnO: 100ml isopropanol solution); **(c)** the low-magnification and high magnification SEM images (**inset**) of as-sprayed T-ZnO and CNT by turns with low concentration T-ZnO and CNT precursor solutions, respectively(8mg T-ZnO: 100ml isopropanol solution; 0.3g CNT: 1L isopropanol solution); **(d)** the low-magnification SEM image of as-sprayed T-ZnO and CNT by turns with high concentration T-ZnO and CNT precursor solutions, respectively(8mg T-ZnO: 100ml isopropanol solution; 0.5g CNT: 1L isopropanol solution).

Fig.S2 (a) J-E curves of the samples of the ZnO film consisting of ZnO nanoparticles; **(b)** the corresponding Fowler-Nordheim (F-N) plots of **(a)**.

Fig.S3 The corresponding luminance photos of the samples of the pure T-ZnO, pure CNTs and T-ZnO/CNTs composite. **(a)** Pure T-ZnO under the voltage of 400V; **(b)** Pure CNTs under the voltage of 500V; **(c)** T-ZnO/CNTs composite under the voltage of 240V.

Fig.S4 the emission stability of pure T-ZnO、pure CNTs and T-ZnO/CNTs.

Fig.S5 the schematic diagram of the field emission measurement and the corresponding electronic circuits. **(a)** The schematic diagram of the field emission test; **(b)** the mechanism diagram for their simple electronic circuits

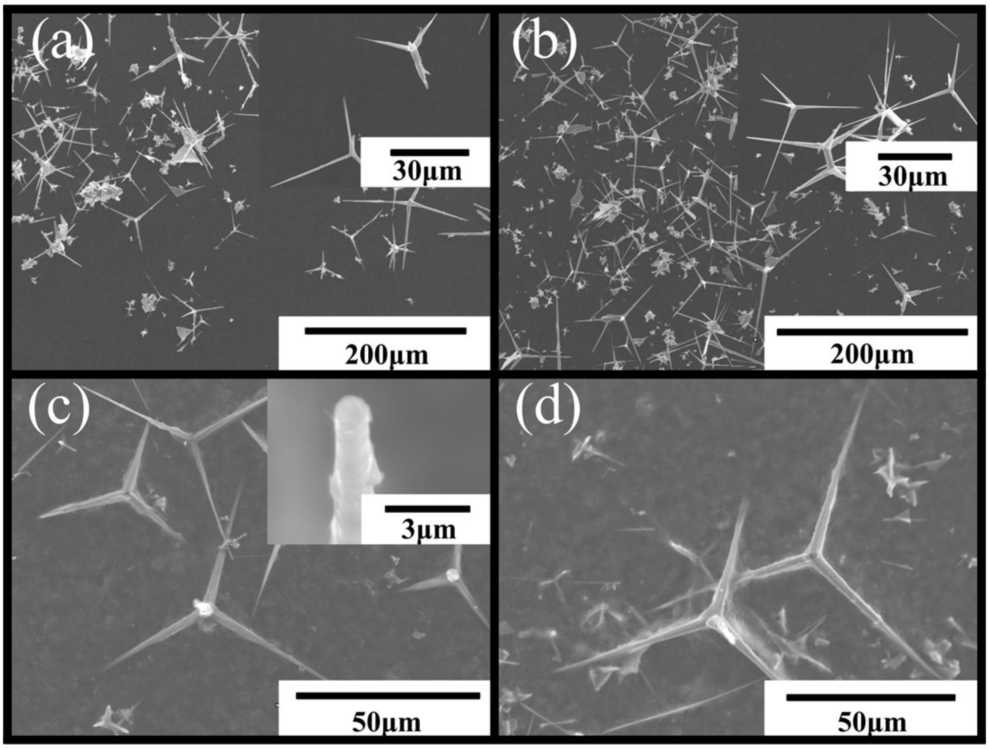


Fig.S1

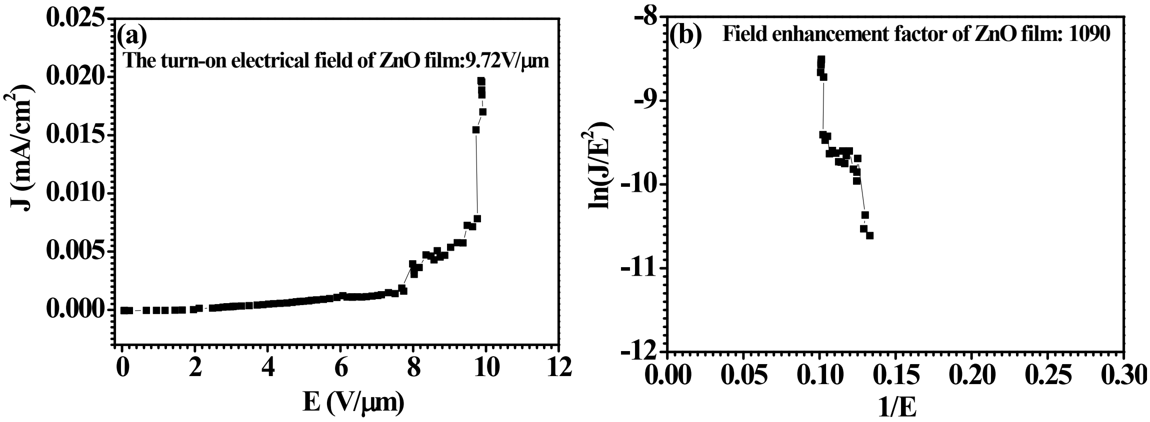

(a)
The turn-on electrical field of ZnO film:9.72V/μm
J (mA/cm2)
E (V/μm)
(b)
Field enhancement factor of ZnO film: 1090
ln(J/E2)
1/E

Fig.S2

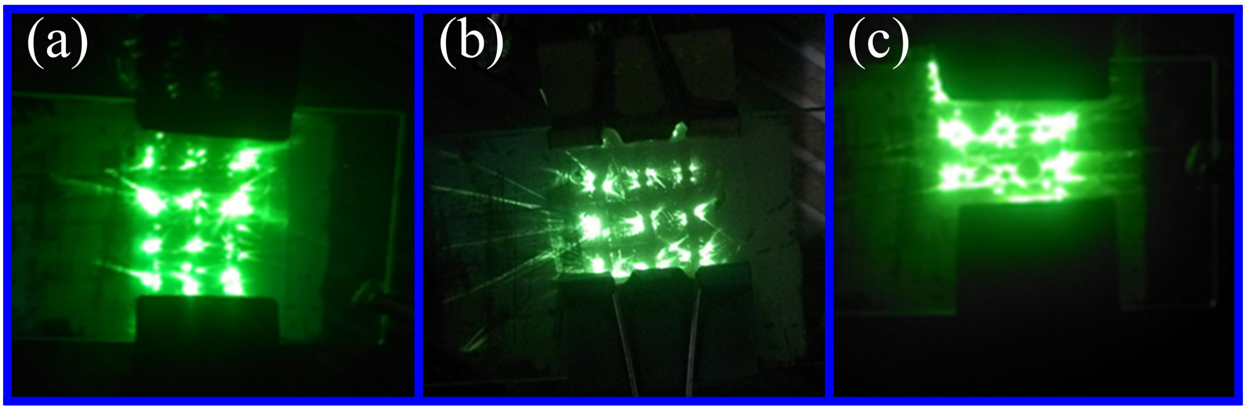


Fig.S3

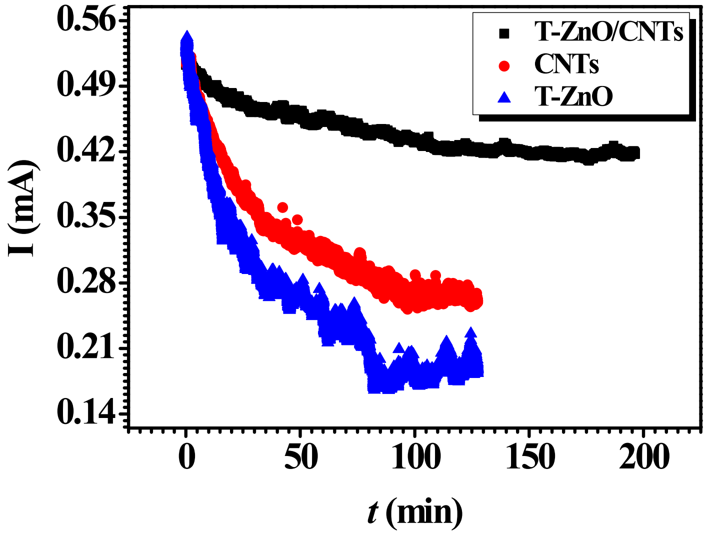
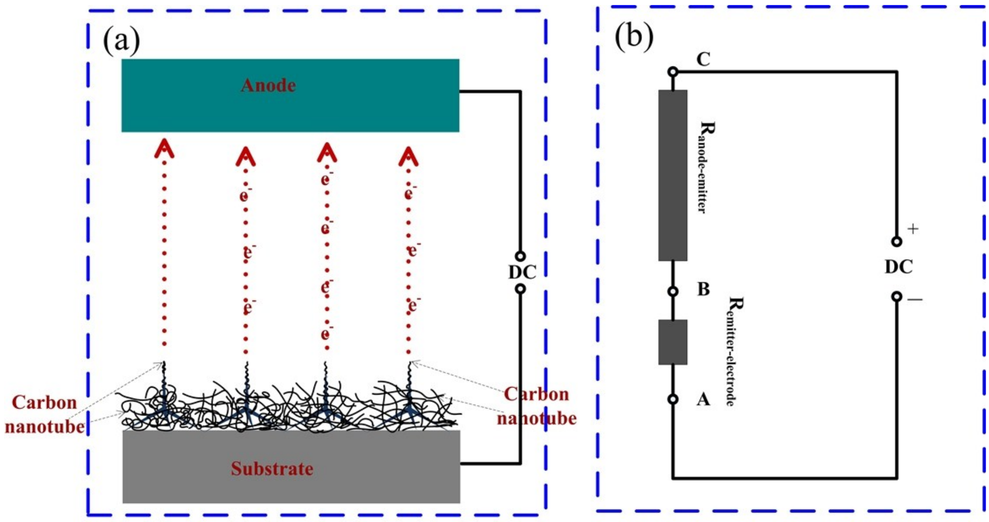

T-ZnO/CNTs
CNTs
T-ZnO
I (mA)
t (min)
0.56
0.49
0.42
0.35
0.28
0.21
0.14
0
50
100
150
200

Fig.S4



$R_{emitter\text{-}electrode}$ is the resistance between the emitter and Cr-Cu-Cr electrode, which mainly includes the heterojunction resistance between emitters and T-ZnO under reverse bias voltage as well as the Schottky resistance between the T-ZnO and the electrode

$R_{anode\text{-}emitter}$ is the resistance between emitters and anode under high vaccum and high voltage condition.

Fig.S5