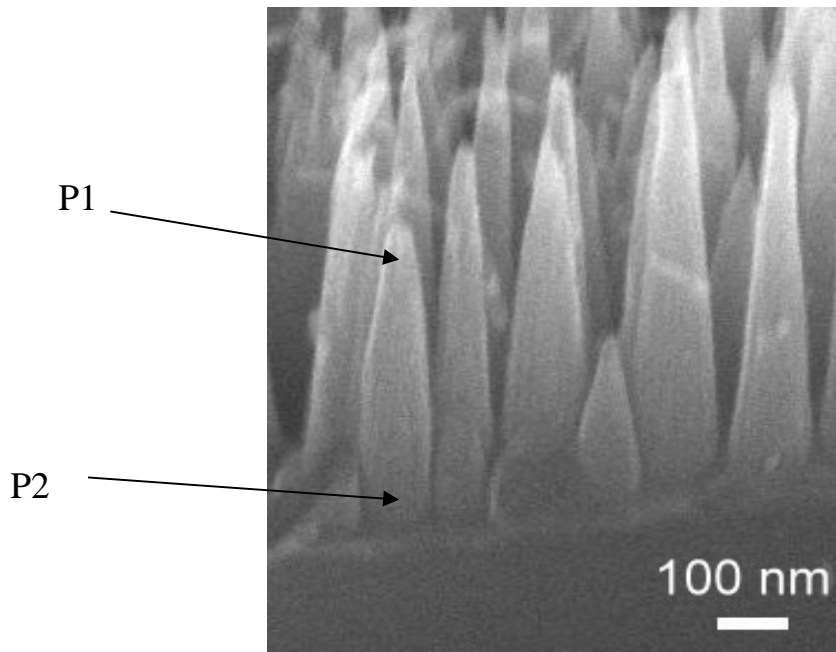
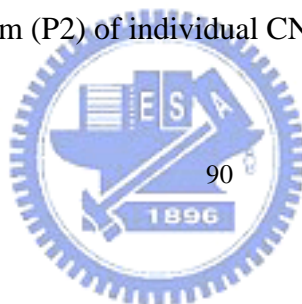


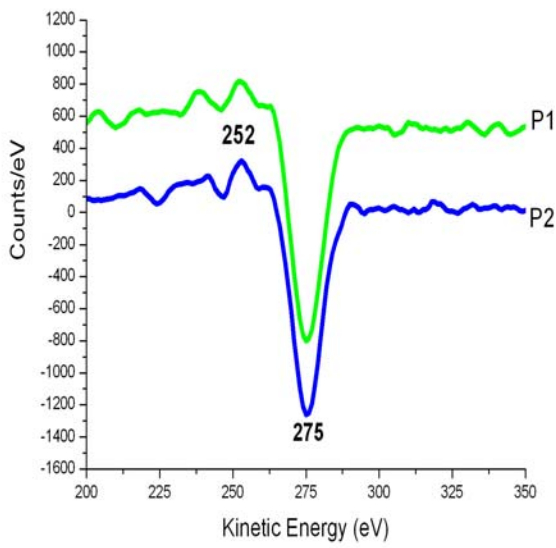
(a)



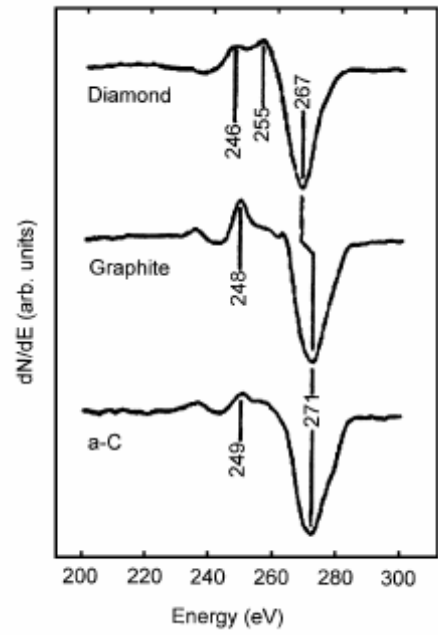
(b)

Figs. 4-27 (a) AES spectra of as-grown CNCs (Specimen B5), where P1 and P2 are detected point of individual CNC as shown in corresponding SEM image (b). The arrowheads are indicate the tip (P1) and bottom (P2) of individual CNC.

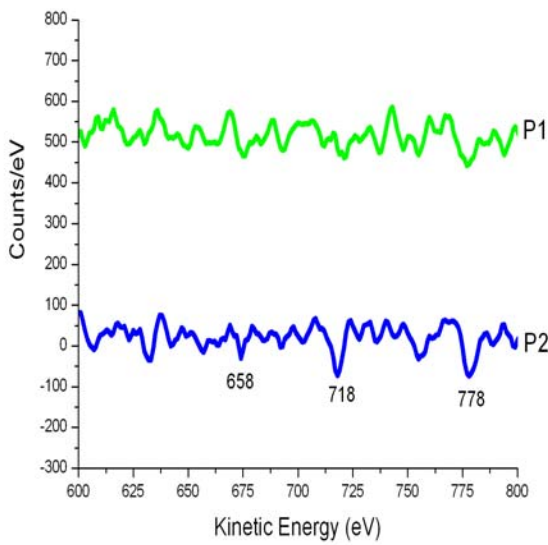




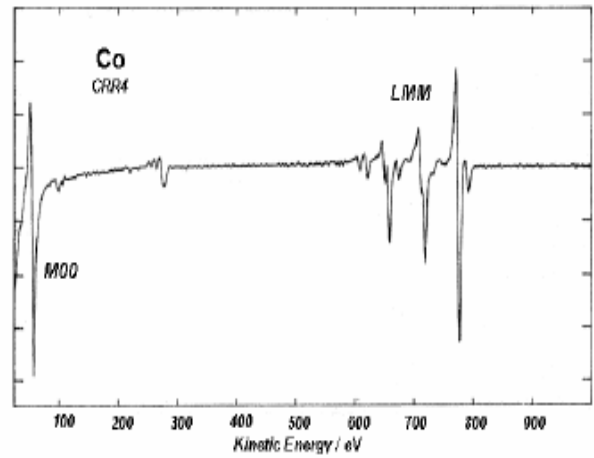
(a)



(b)



(c)



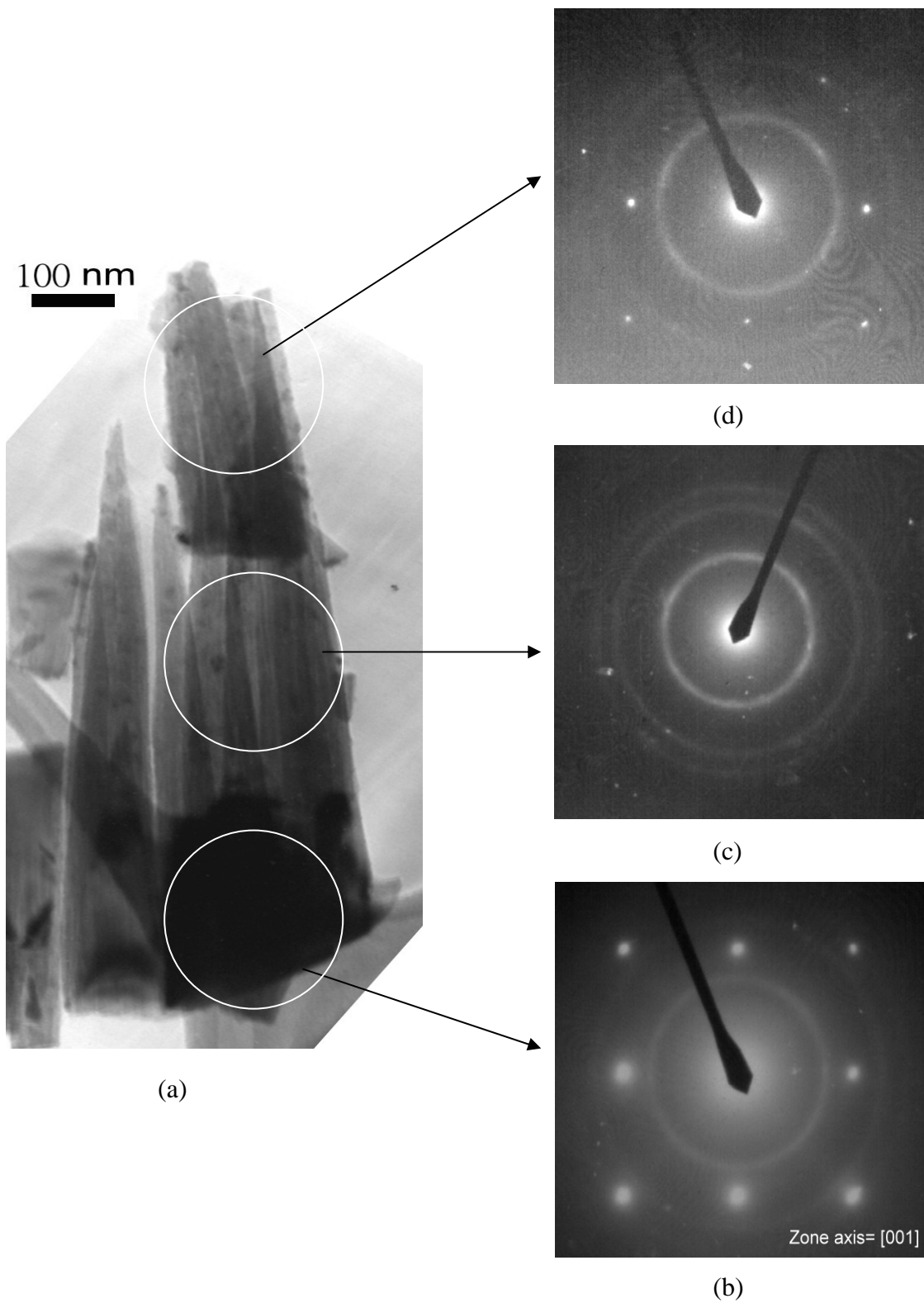
(d)

Figs. 4-28 AES spectra are corresponding to the Figs.4-27 at selective segment.

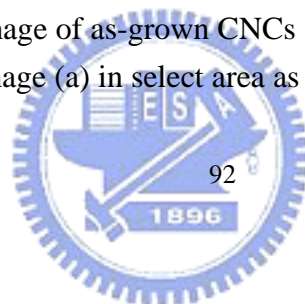
(a) the AES spectrum of carbon (b) reference spectrum of carbon [Lin-01-126]

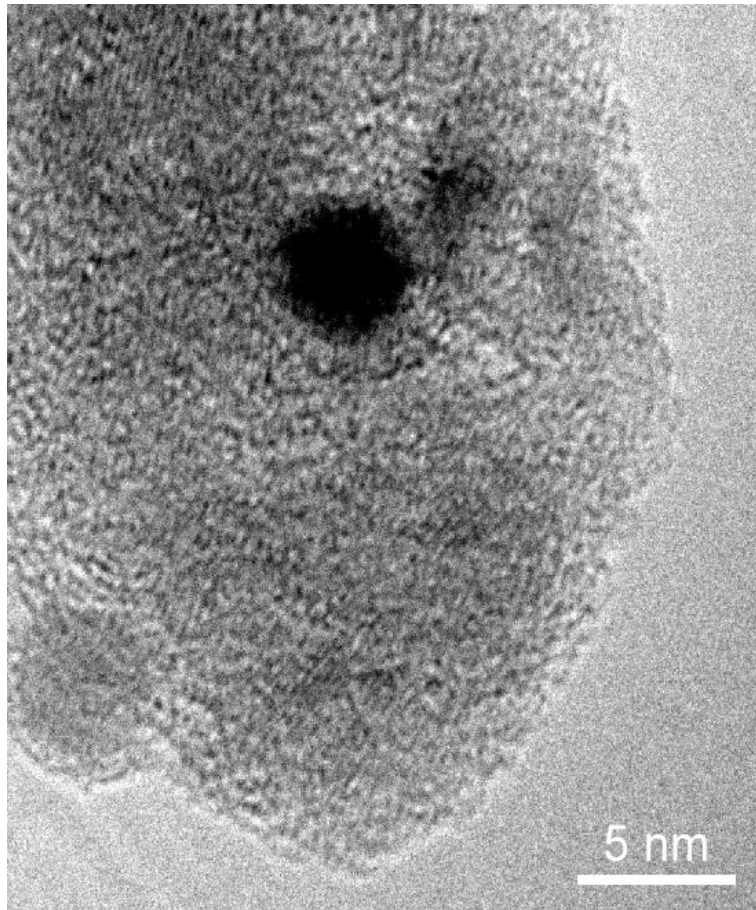
(c) the AES spectrum of cobalt (d)reference spectrum of cobalt [Ferguson-98-63]



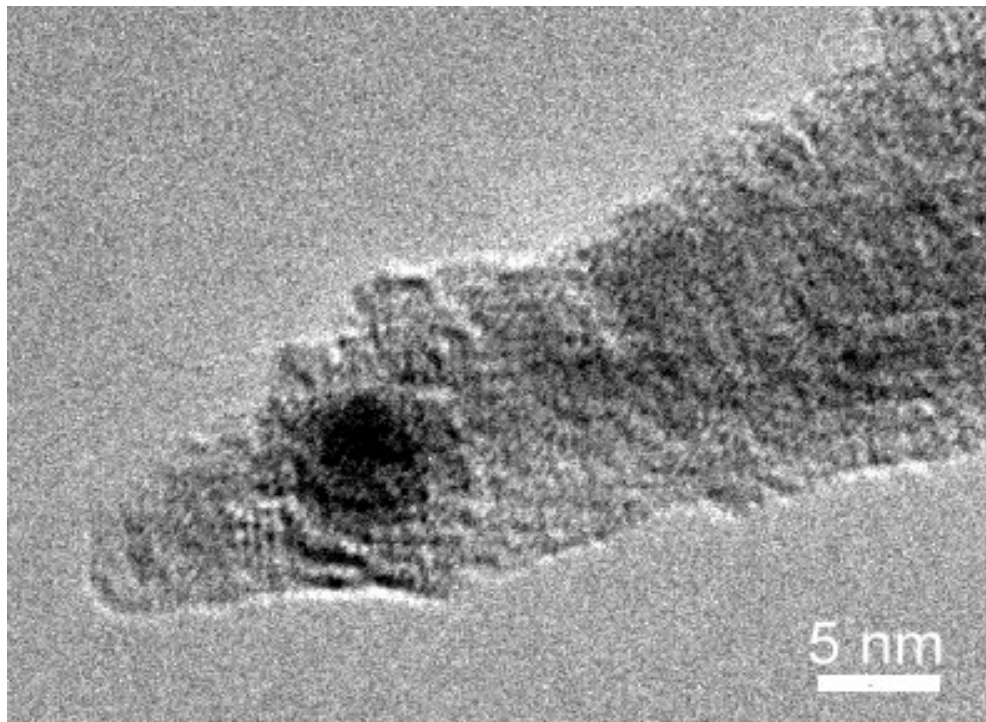


Figs. 4-29 (a) TEM bright field image of as-grown CNCs (Specimen B5). ED pattern of (b), (c) and (d) are corresponding to image (a) in select area as indicate by arrowhead.





(a)



(b)

Figs.4-30 HRTEM images of as-grown CNCs (Specimen B5).
image (a) and (b) show the tip of two individual CNCs

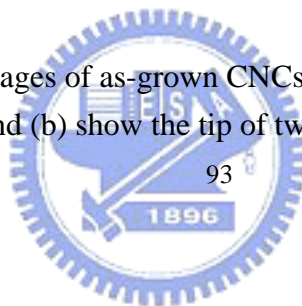
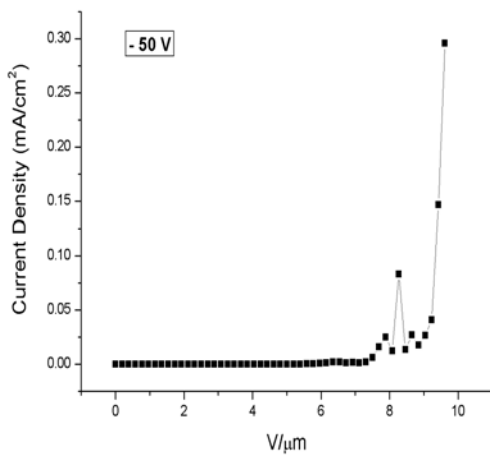
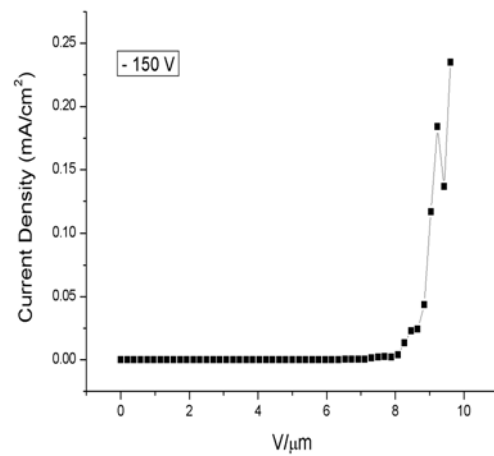


Table 4-8 FE properties of as-grown CNCs under different negative applied bias

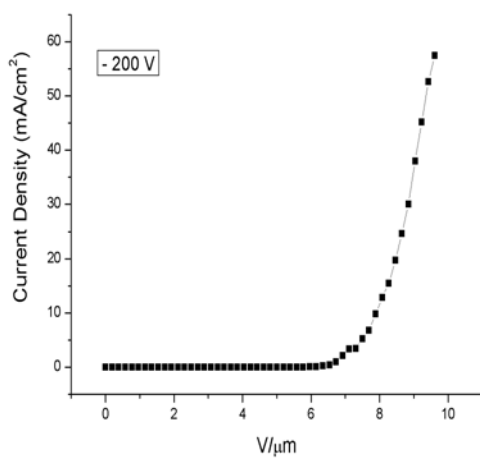
Remark	Specimen	Applied bias (V)	$E_{\text{turn-on}}$ at $10\mu\text{A}/\text{cm}^2$ ($\text{V}/\mu\text{m}$)	$E_{\text{threshold}}$ at $10\text{ mA}/\text{cm}^2$ ($\text{V}/\mu\text{m}$)	Current density at $10\text{ V}/\mu\text{m}$ (mA/cm^2)
(a)	B2	-50	7.6	not reach	0.28
(b)	B3	-150	8.26	not reach	0.23
(c)	B4	-200	5.76	8.10	58.71
(d)	B5	-300	5.0	6.99	173.42



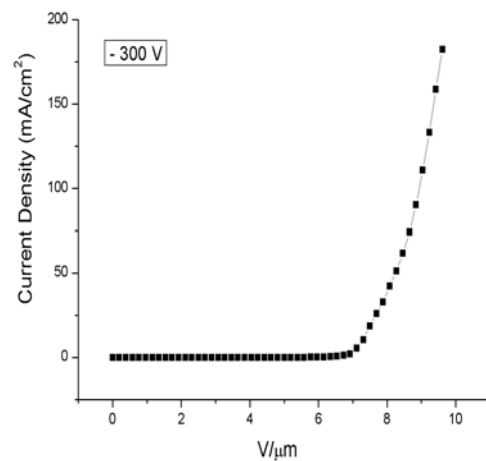
(a)



(b)



(c)



(d)

Figs.4-31 J-E curves of as-grown CNCs under different applied bias

(a) -50 V (b) -150 V (c) -200 V (d) -300 V



Table 4-9 The field enhancement factor β of as-grown CNCs (Specimen B5)

Specimen	Applied bias (V)	Field Enhancement Factor β
B5	-300	4993

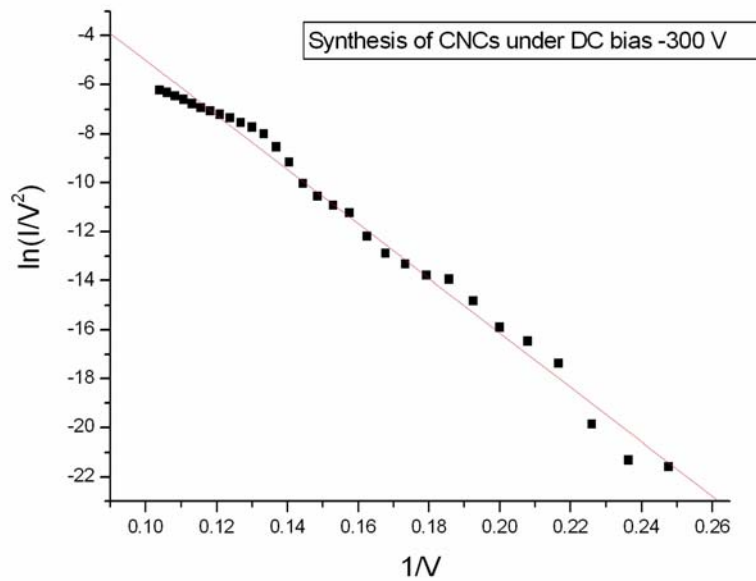


Fig.4-32 F-N plot of as-grown CNCs (Specimen B5)

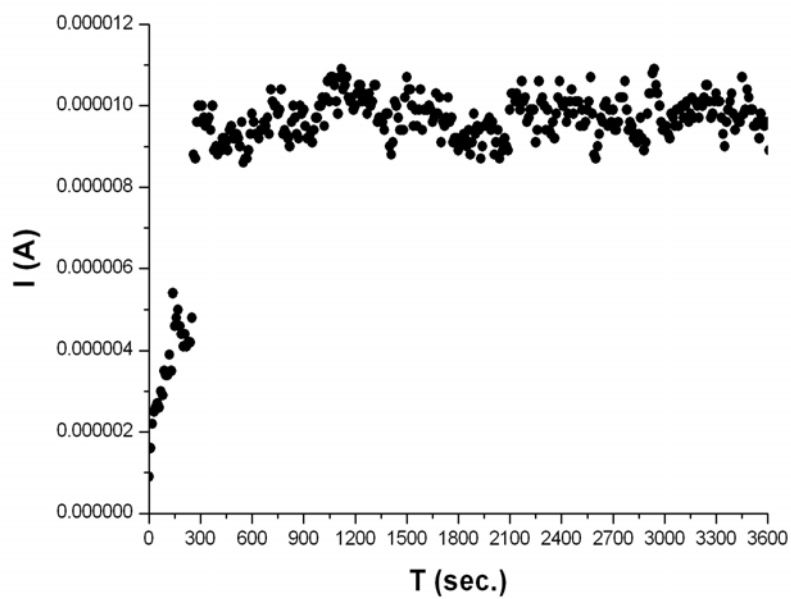


Fig.4-33 I-T curve of as-grown CNCs (Specimen B5)

