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## APPENDICES

### Appendix A Calculation for Molar Concentration of Nitric Acid

From;

$$M = \frac{\% \times 10 \times d}{Mw}$$

Where,

M	=	molar concentration, M
%	=	percentage of nitric acid, %
d	=	density of nitric acid, g/cm <sup>3</sup>
Mw	=	molecular weight of nitric acid, g/mol

70 % of nitric acid;

$$\begin{aligned} M &= \frac{\% \times 10 \times d}{Mw} \\ &= \frac{70 \times 10 \times 1.41}{63.01} \\ &= 15.66 \end{aligned}$$

From;

$$M_1 V_1 = M_2 V_2$$

where,

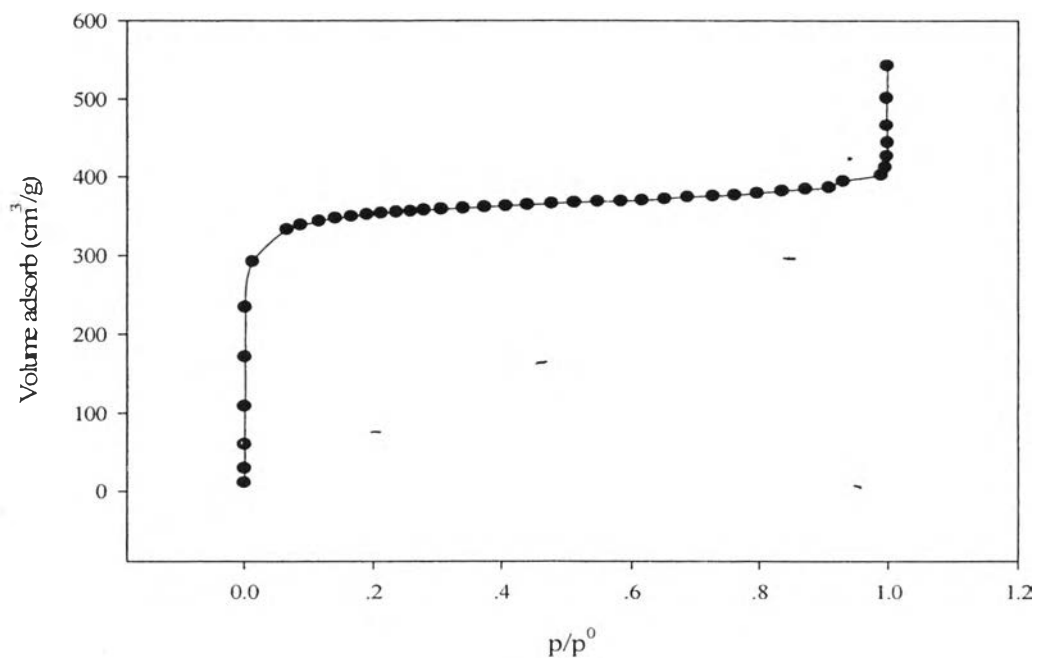
$V_1, V_2$  = volume of nitric acid, cm<sup>3</sup>

10 cm<sup>3</sup> of 10M nitric acid;  $15.66 \times V_1 = 10 \times 10$

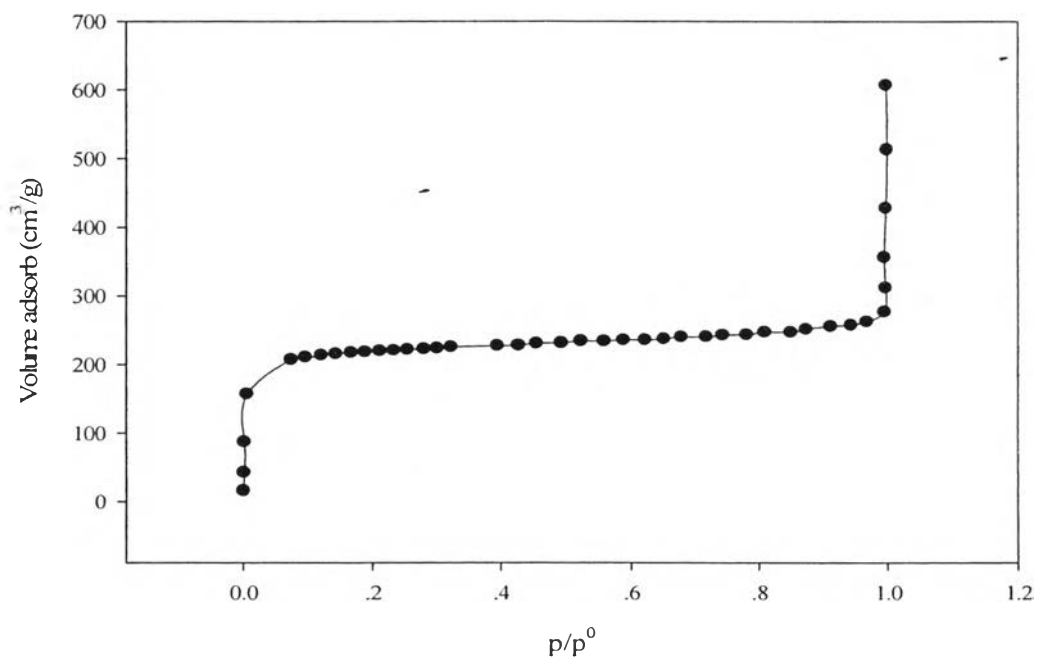
$$V_1 = 6.39$$

6.39 cm<sup>3</sup> of 70 % (15.66 M) nitric acid was mixed with 3.71 cm<sup>3</sup> of deionized water to obtain 10 cm<sup>3</sup> of 10 M nitric acid.

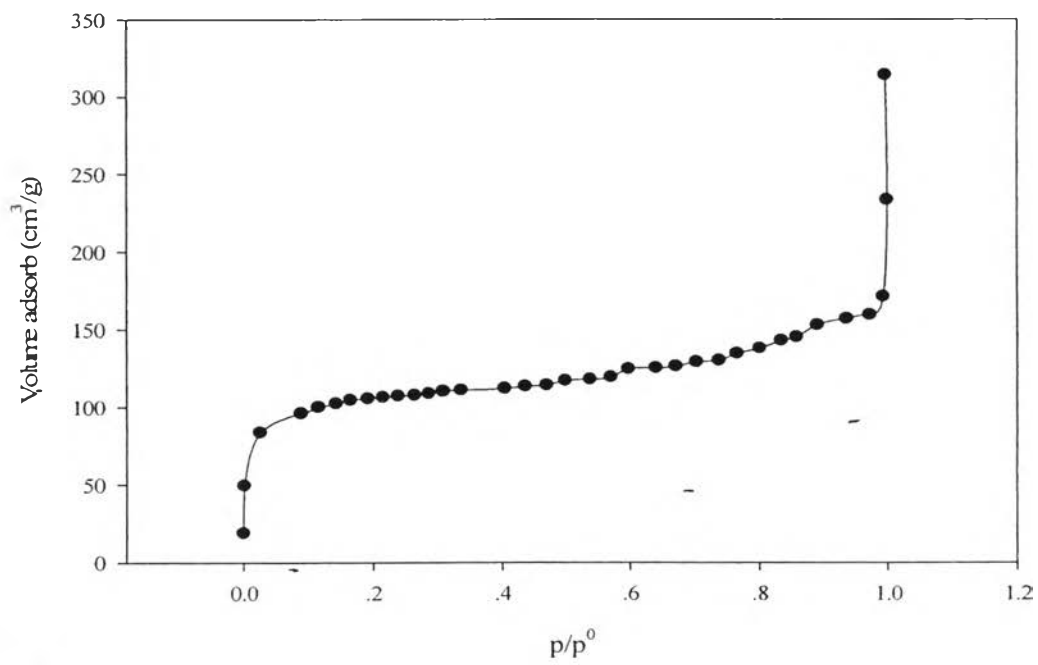
## Appendix B Nitrogen Adsorption Isotherm of Adsorbents at -196 °C



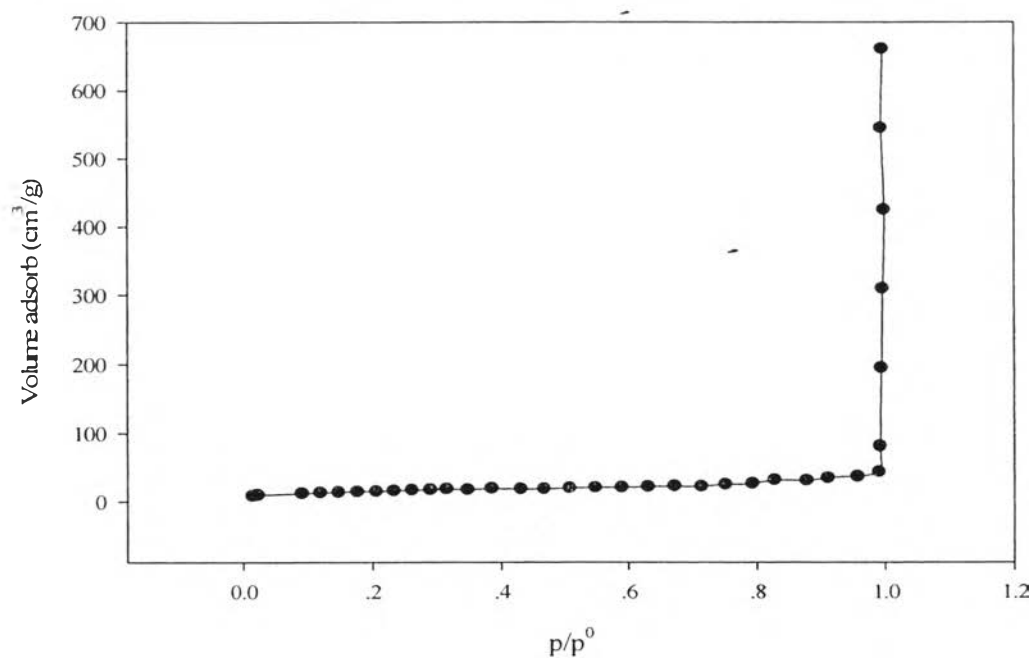
**Figure B1** Nitrogen isotherm of AC.



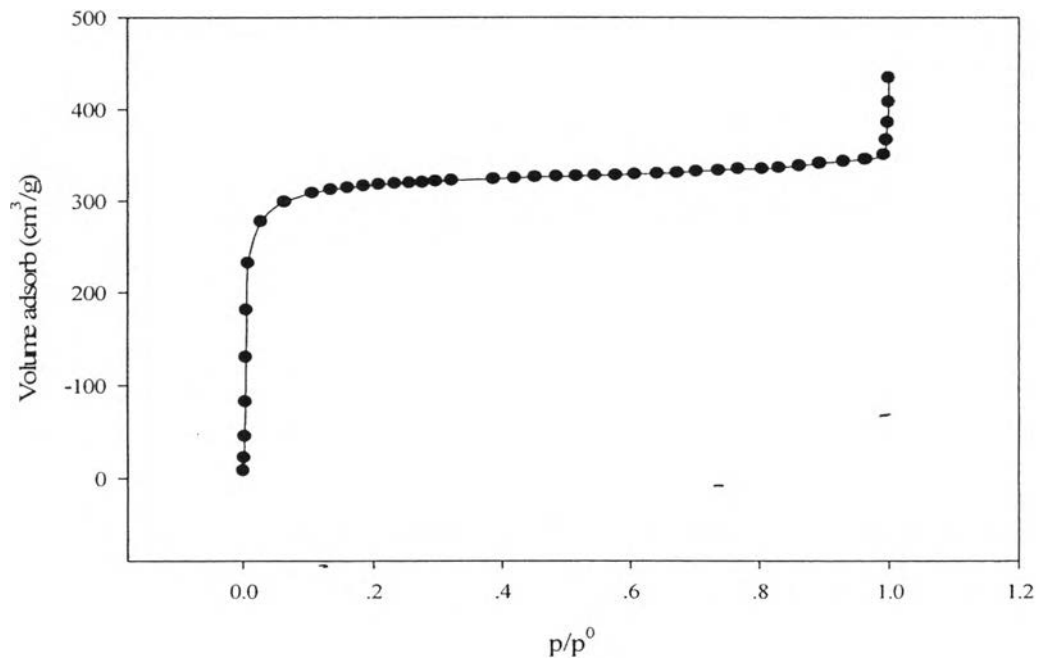
**Figure B2** Nitrogen isotherm of 10/AC.



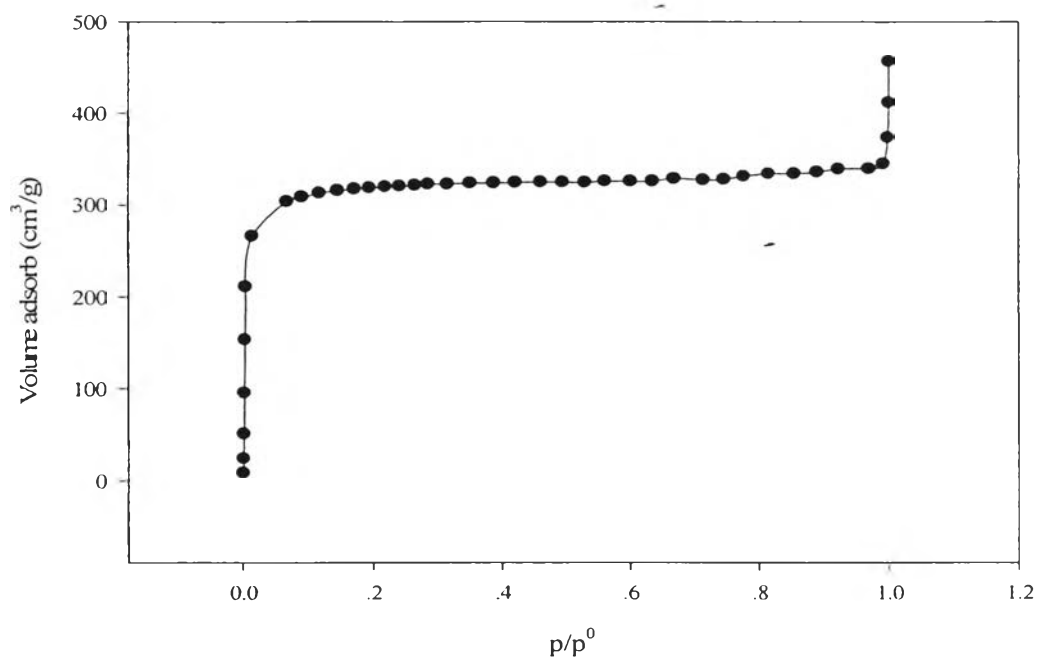
**Figure B3** Nitrogen isotherm of 20/AC.



**Figure B4** Nitrogen isotherm of 30/AC.

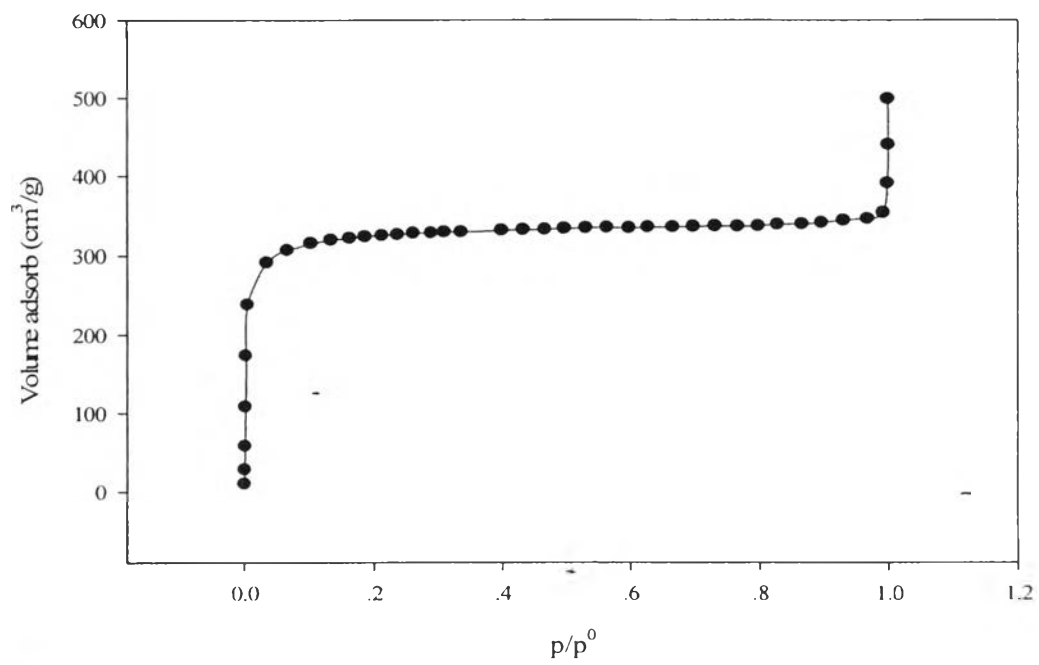


**Figure B5** Nitrogen isotherm of OX/5/8.

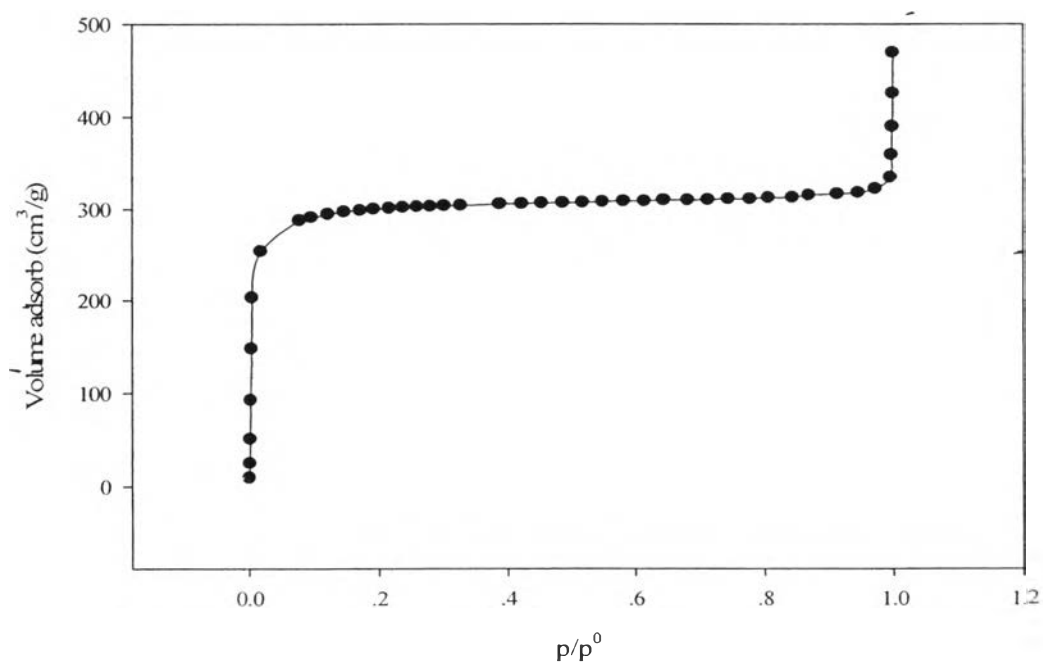


**Figure B6** Nitrogen isotherm of OX/10/1.

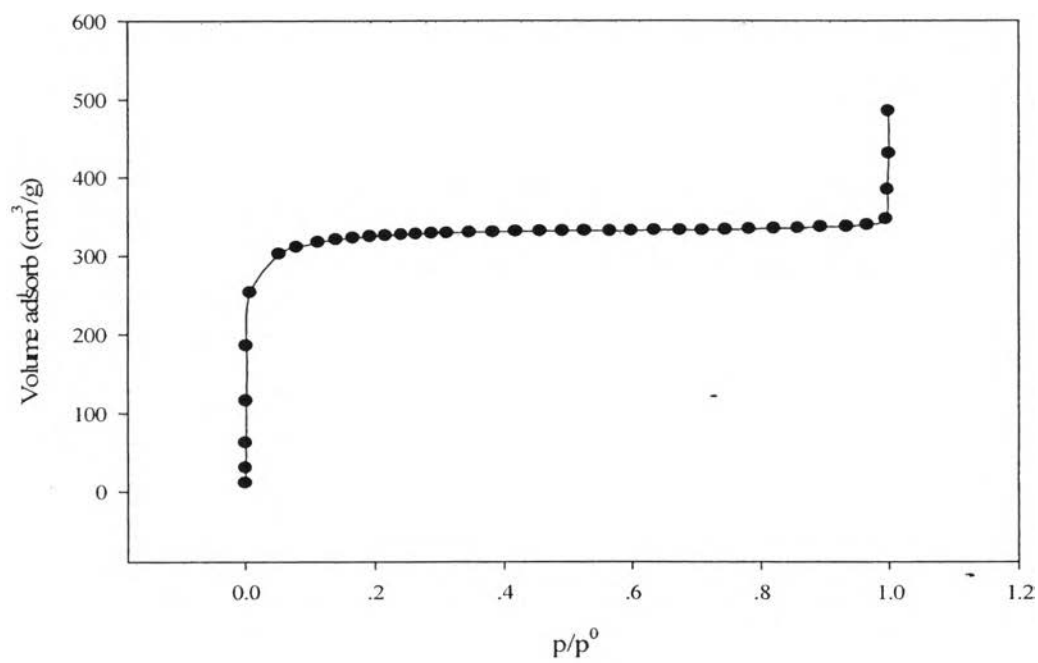




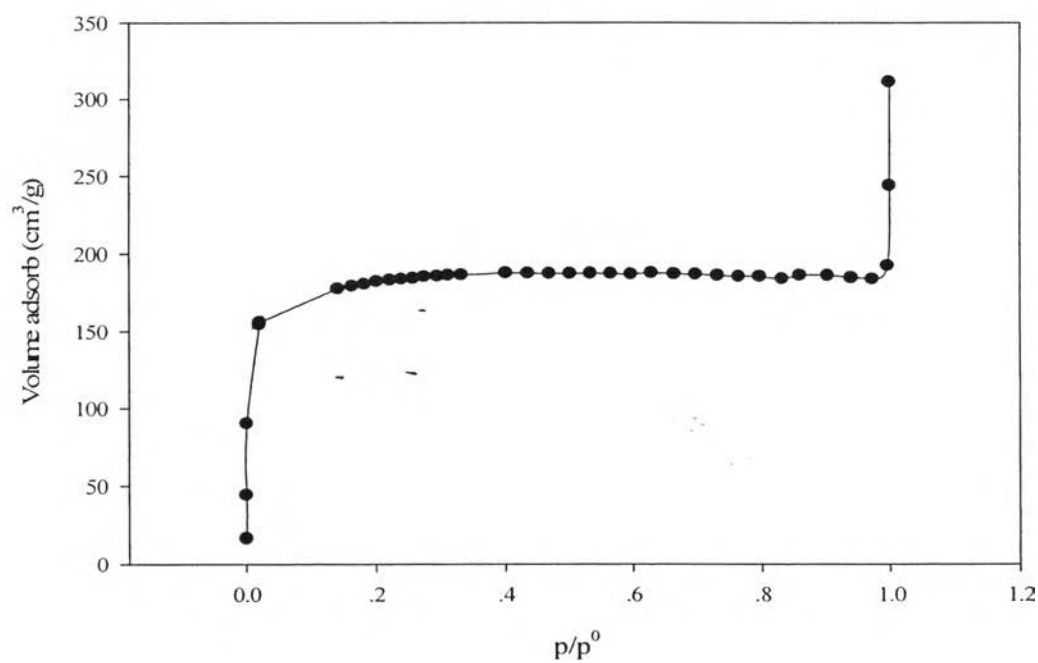
**Figure B7** Nitrogen isotherm of OX/10/4.



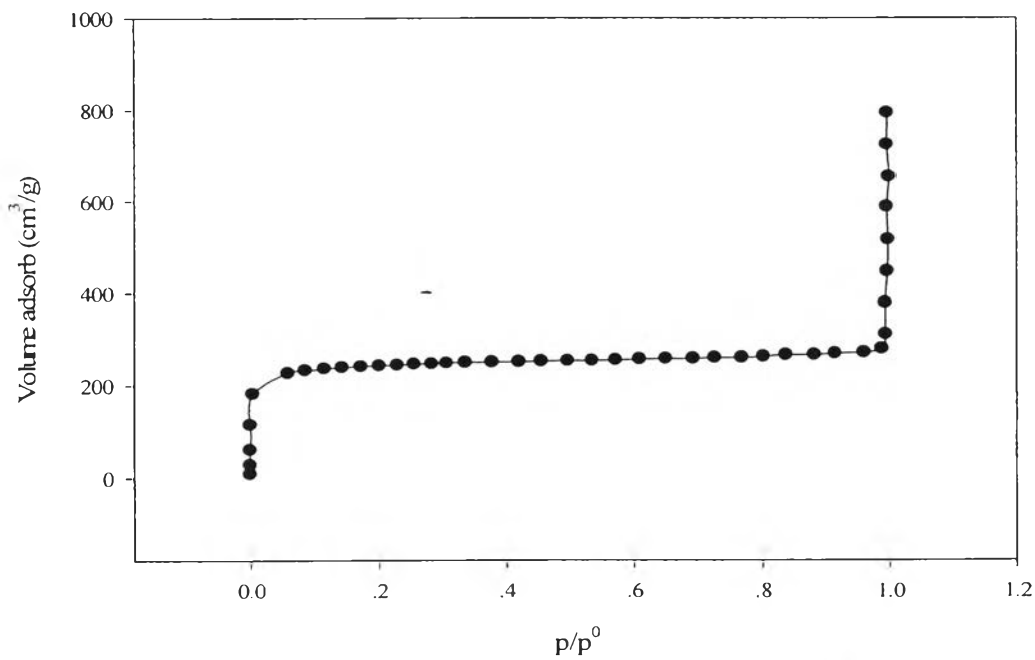
**Figure B8** Nitrogen isotherm of OX/10/8.



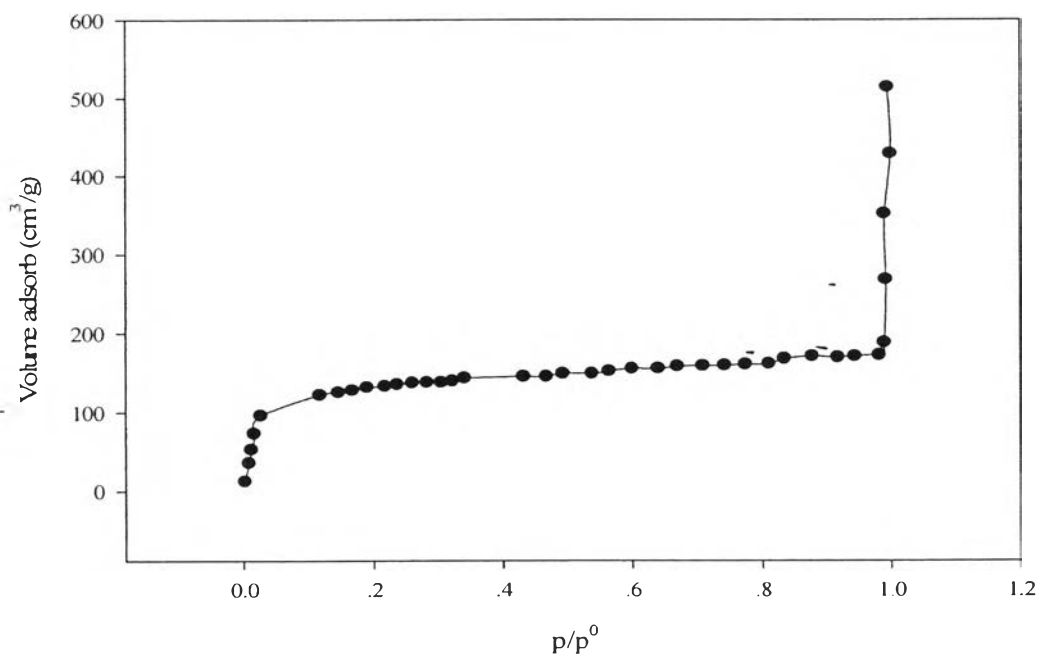
**Figure B9** Nitrogen isotherm of OX/15/8.



**Figure B10** Nitrogen isotherm of 10/OX/5/8.

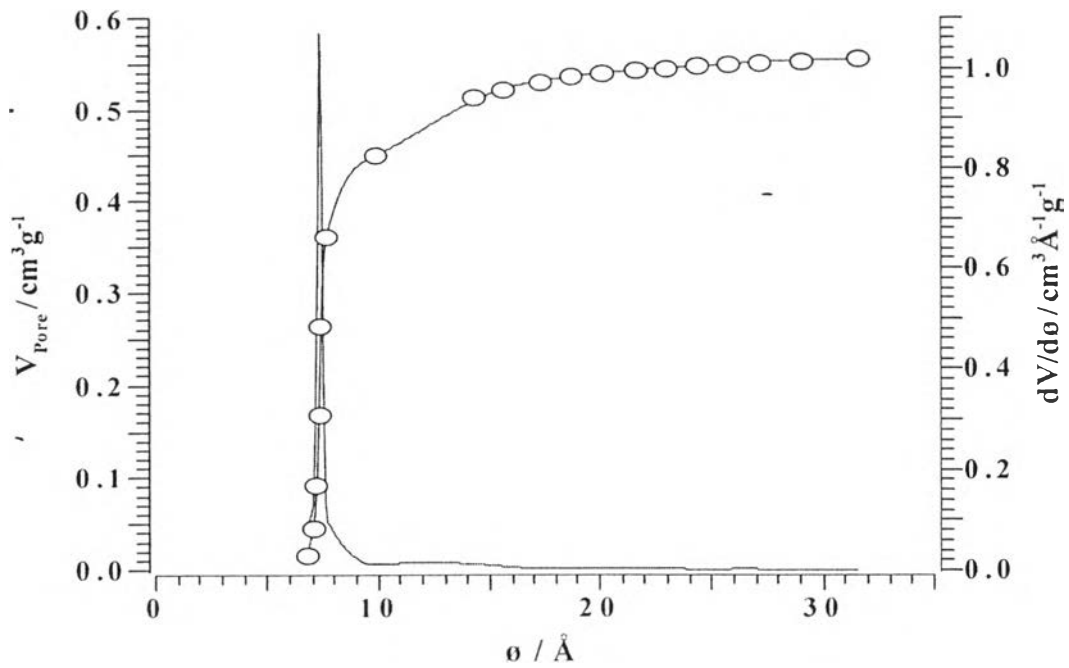


**Figure B11** Nitrogen isotherm of 10/OX/10/8.

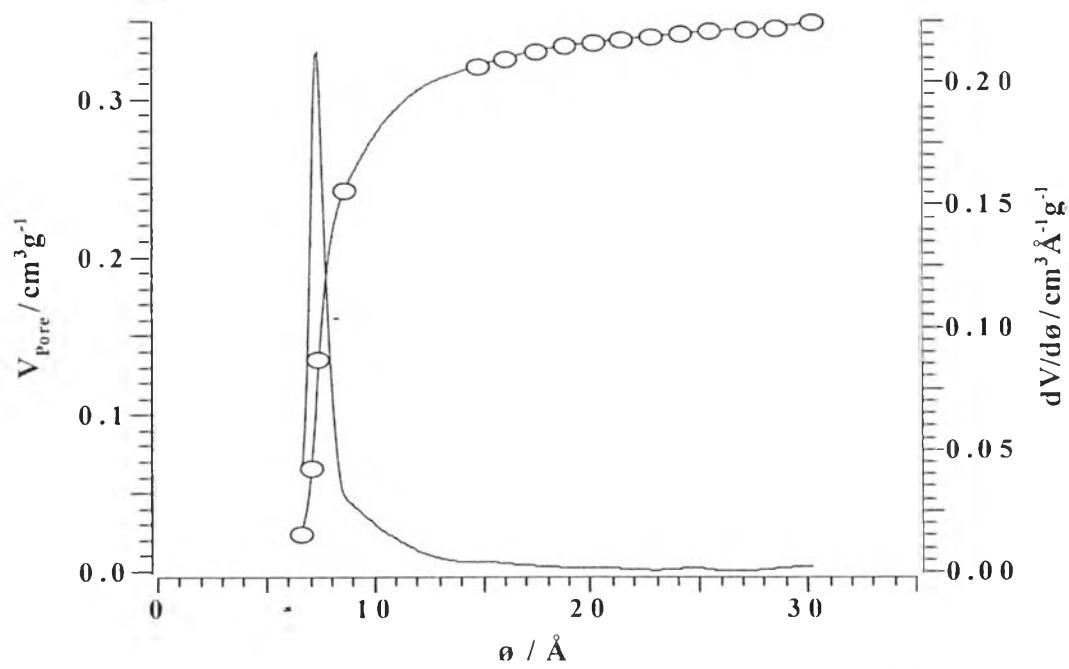


**Figure B12** Nitrogen isotherm of 10/OX/15/8.

**Appendix C Pore Size Distribution Calculated by Horvath Kawazoe (HK)  
Method**



**Figure C1** Pore size distribution of AC.



**Figure C2** Pore size distribution of 10/AC.

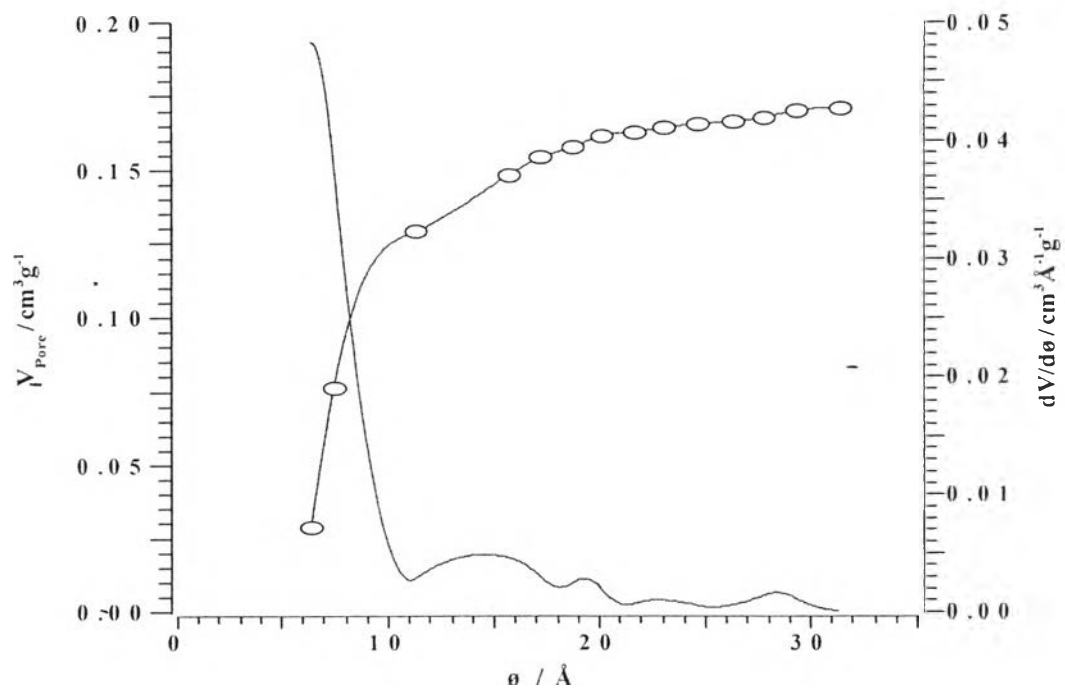


Figure C3 Pore size distribution of 20/AC.

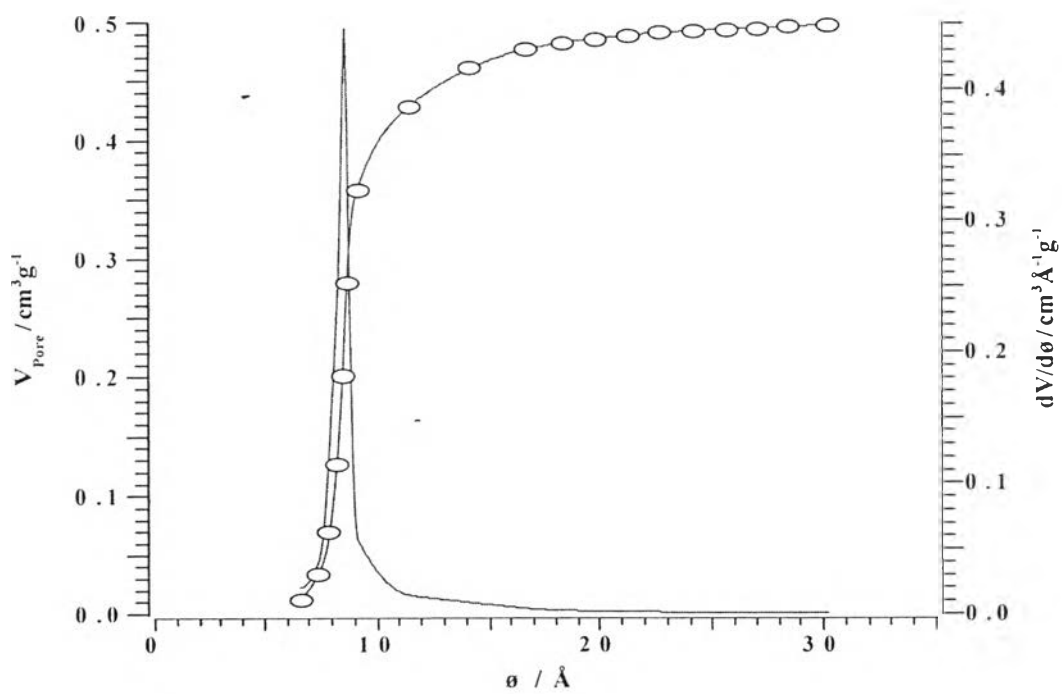


Figure C4 Pore size distribution of OX/5/8.

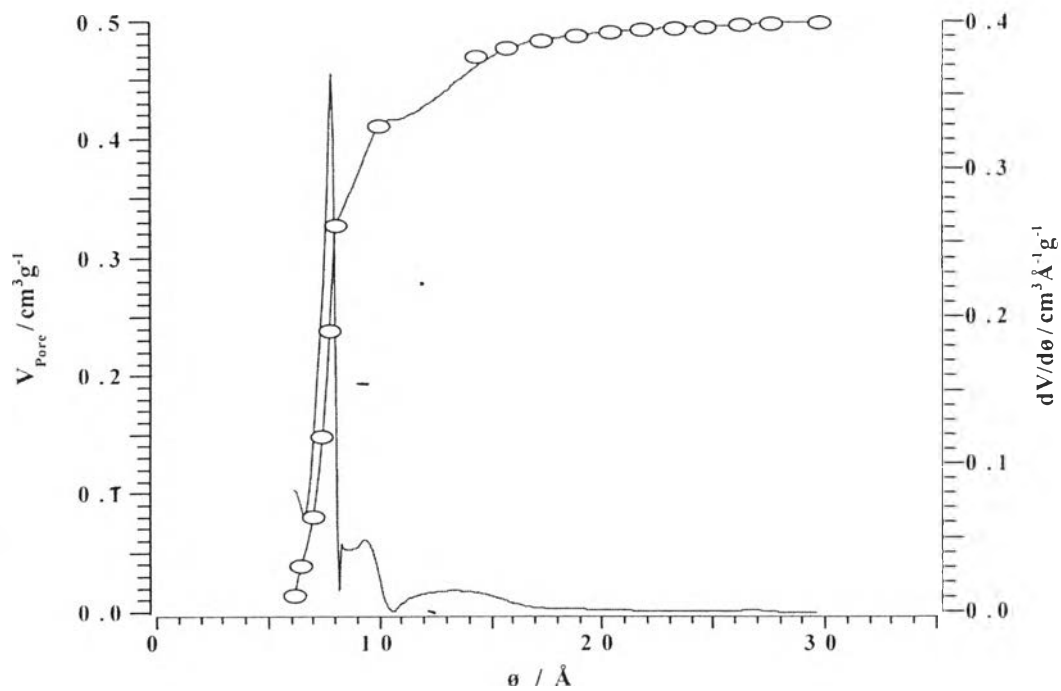


Figure C5 Pore size distribution of OX/10/1.

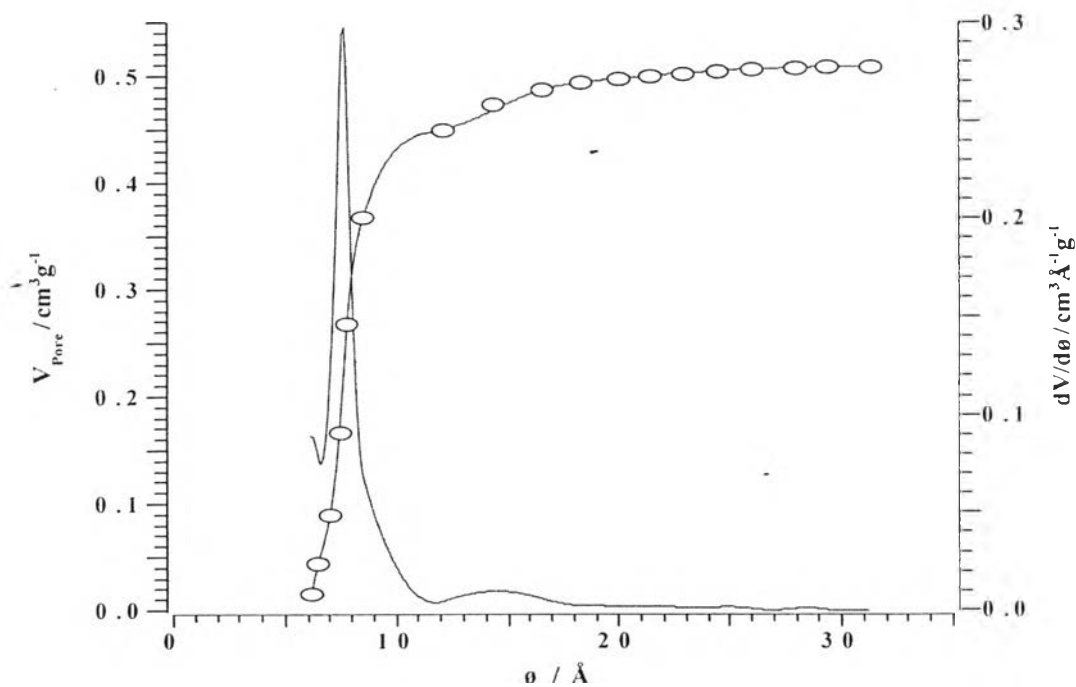


Figure C6 Pore size distribution of OX/10/4.

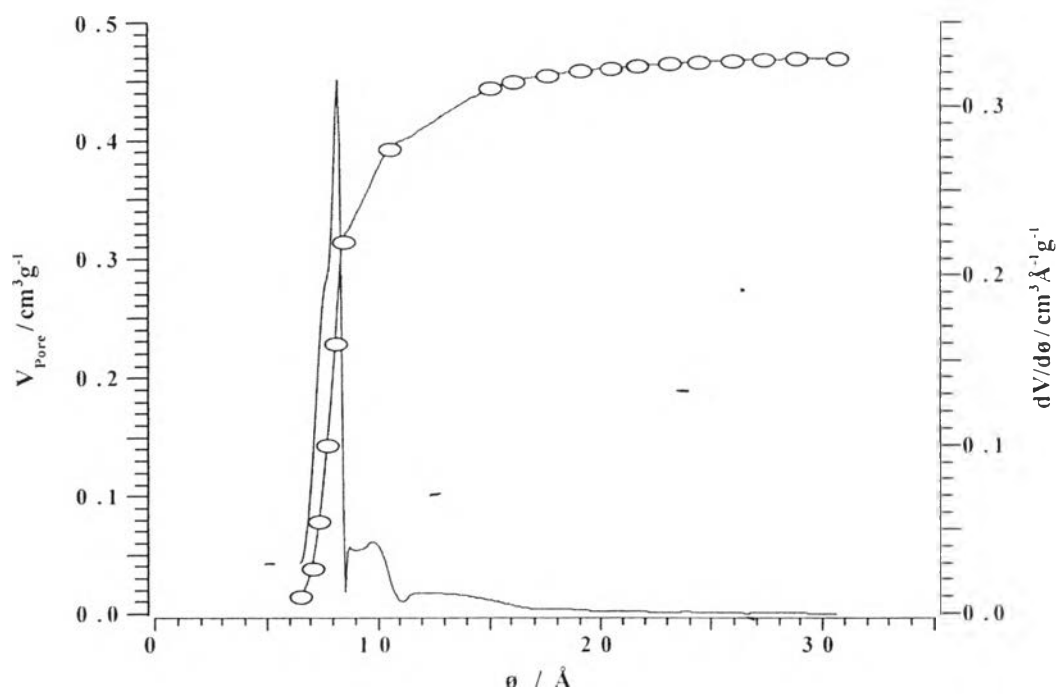


Figure C7 Pore size distribution of OX/10/8.

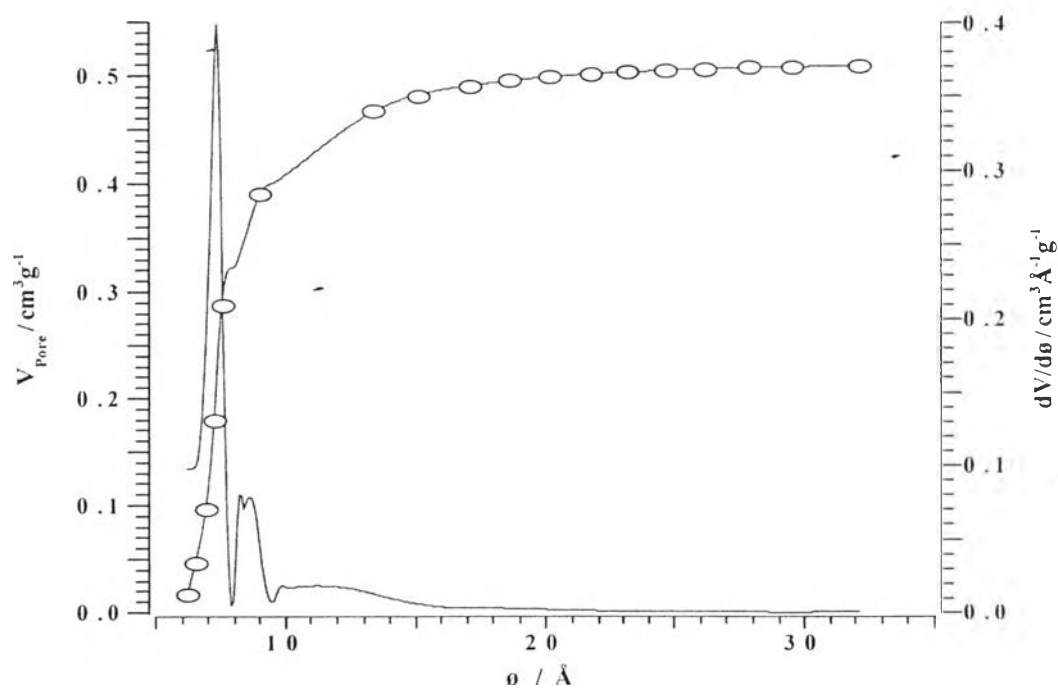


Figure C8 Pore size distribution of OX/10/8.

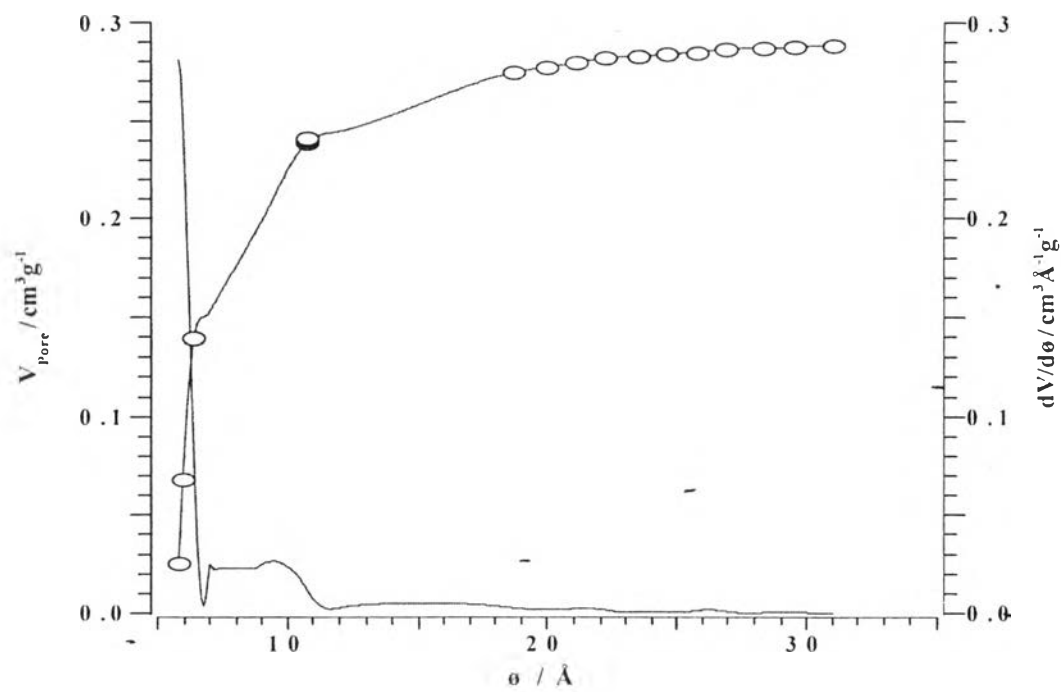


Figure C9 Pore size distribution of 10/OX/5/8.

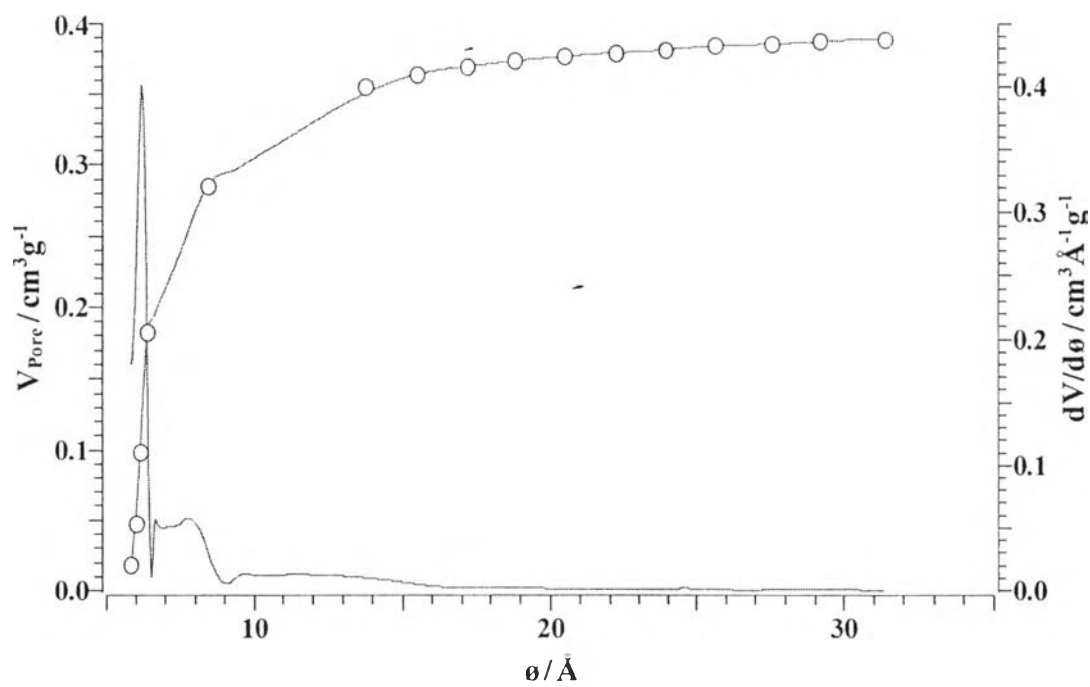


Figure C10 Pore size distribution of 10/OX/10/8.



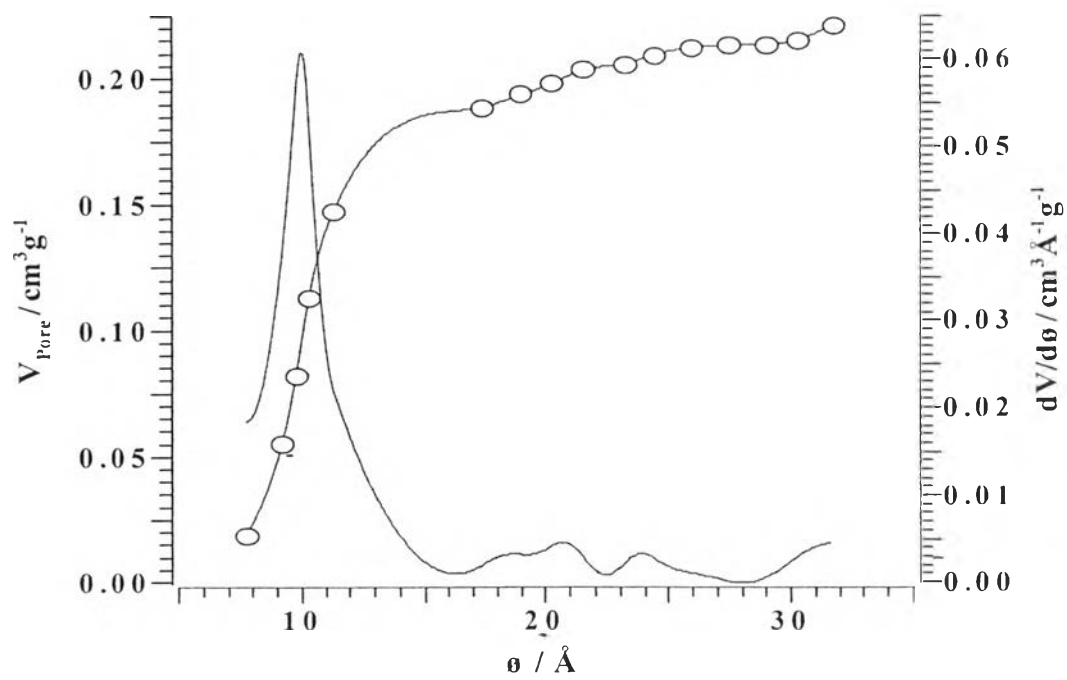
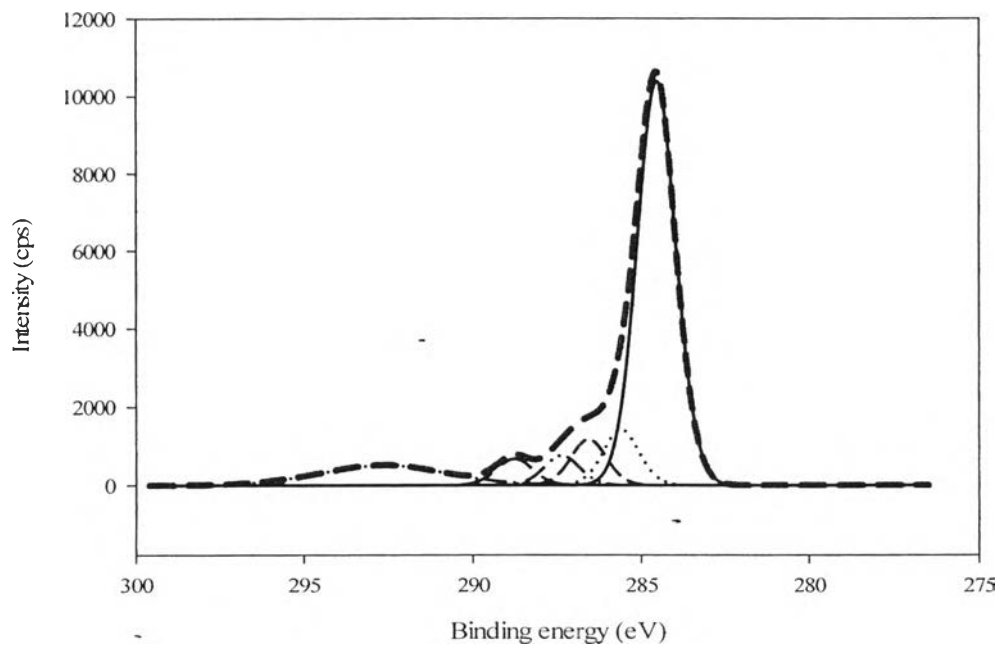
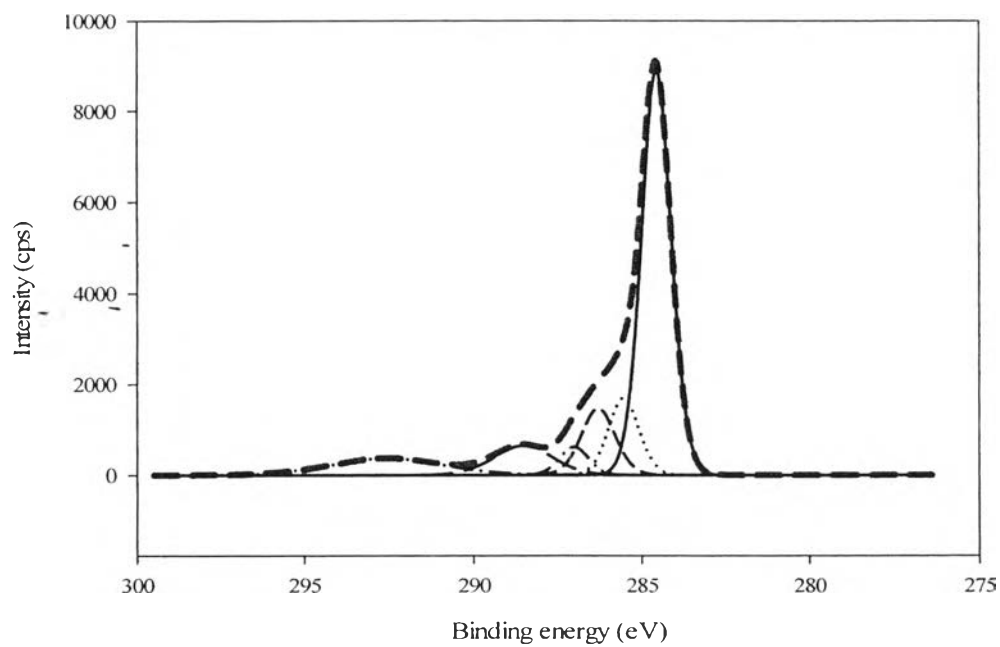


Figure C11 Pore size distribution of 10/OX/15/8.

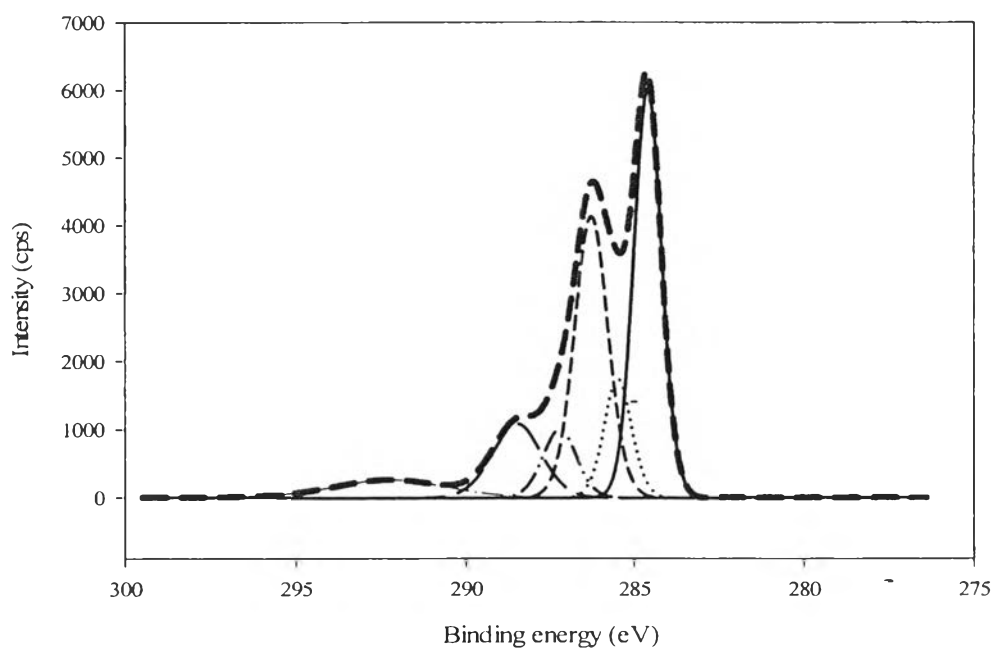
## Appendix D The Deconvolution of C1s XPS Spectra



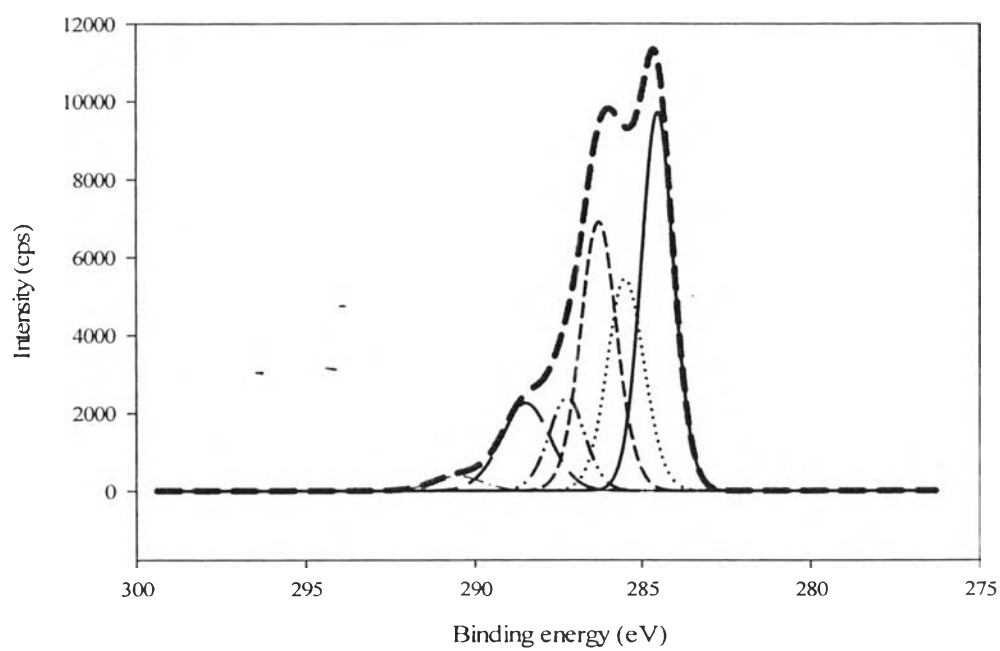
**Figure D1** C1s XPS spectra of AC.



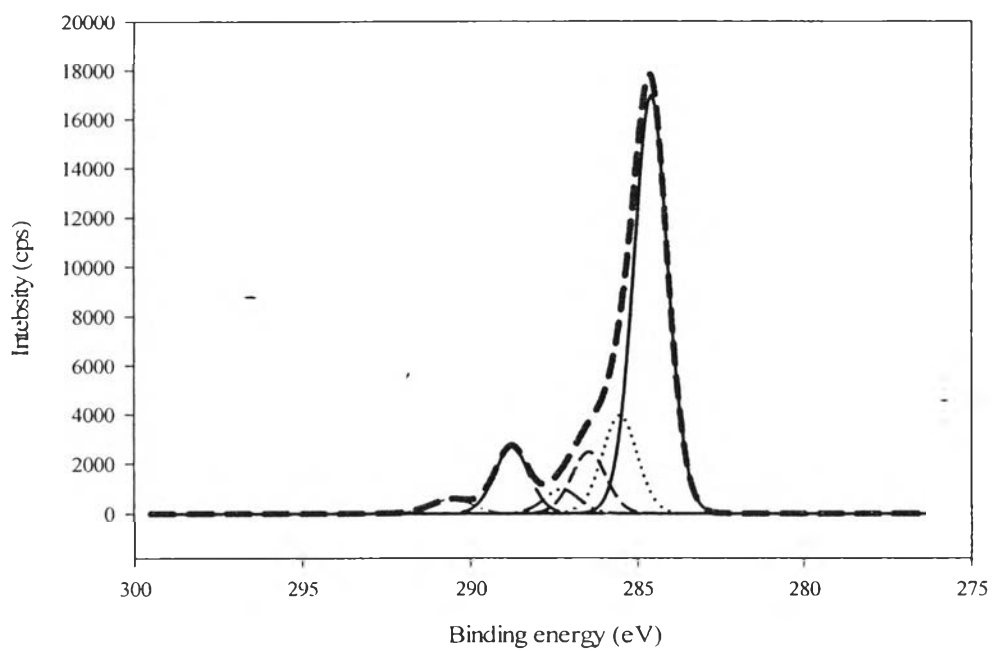
**Figure D2** C1s XPS spectra of 10/AC.



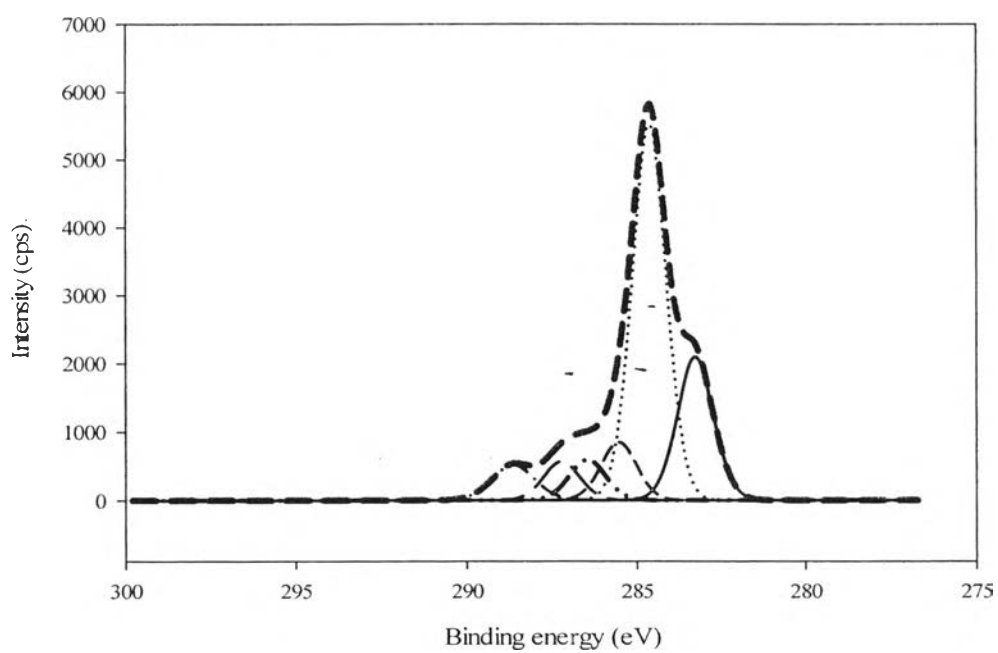
**Figure D3** C1s XPS spectra of 20/AC.



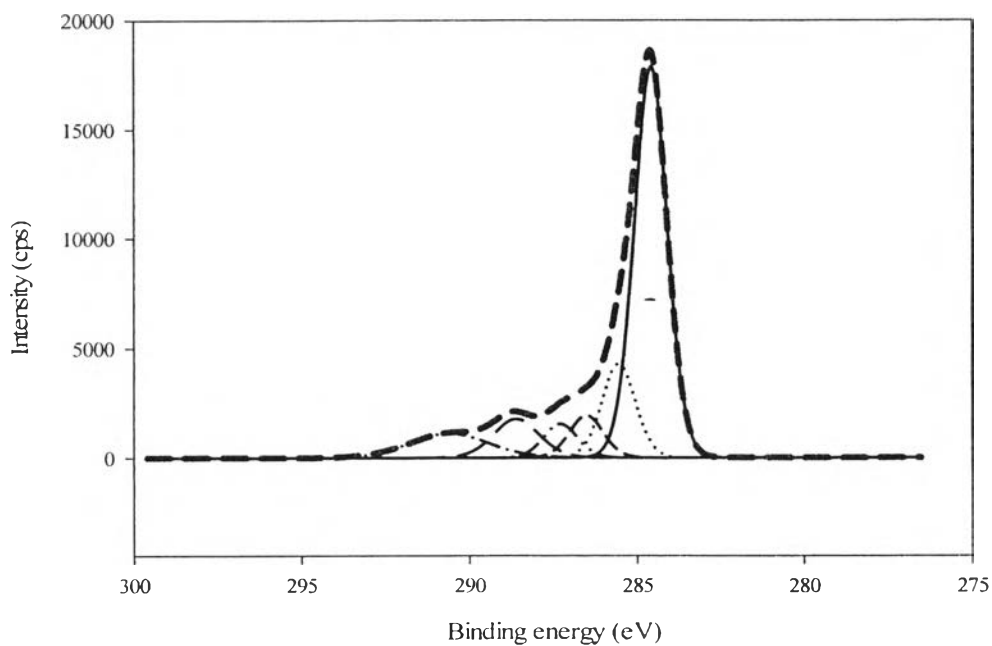
**Figure D4** C1s XPS spectra of 30/AC.



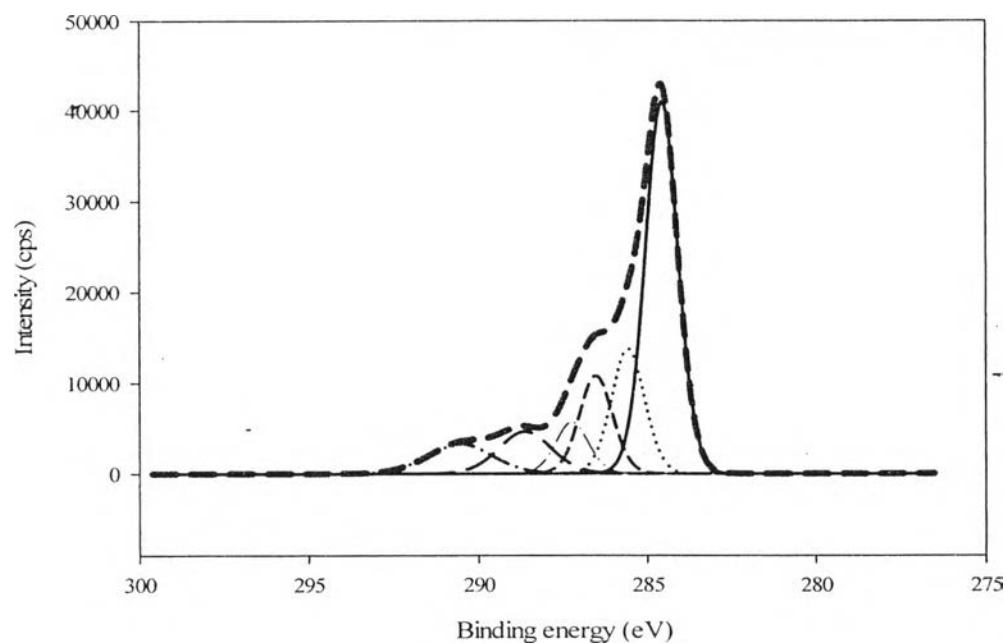
**Figure D5** C1s XPS spectra of OX/5/8.



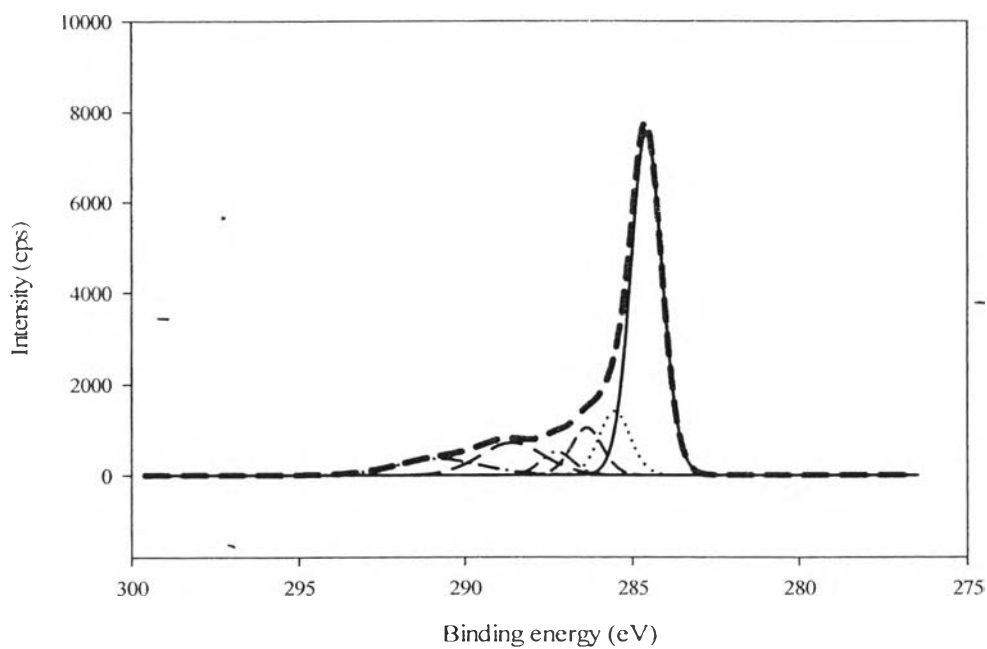
**Figure D6** C1s XPS spectra of OX/10/1.



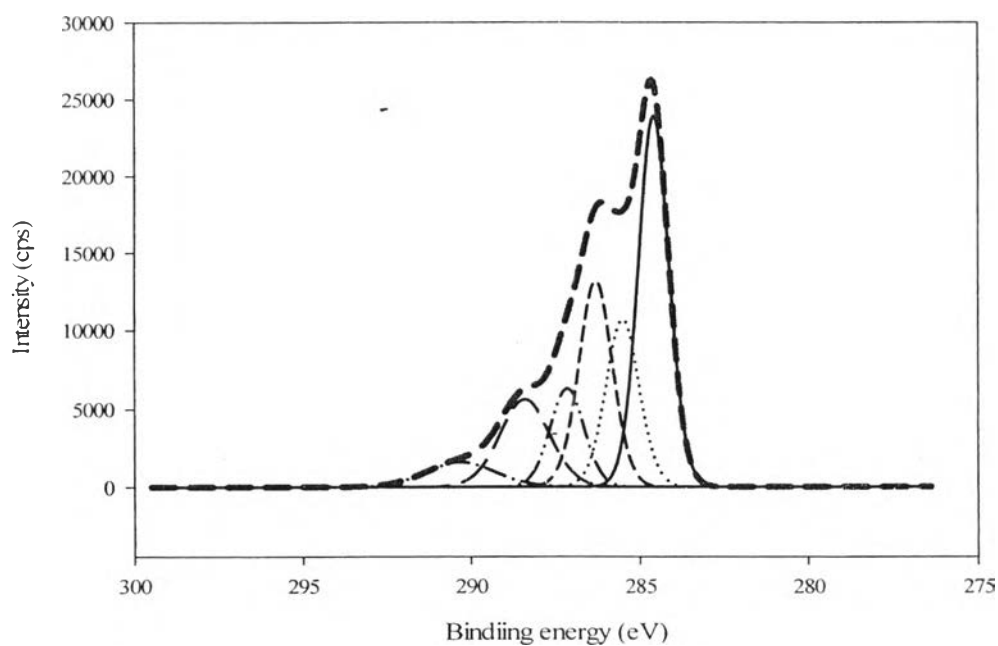
**Figure D7** C1s XPS spectra of OX/10/4.



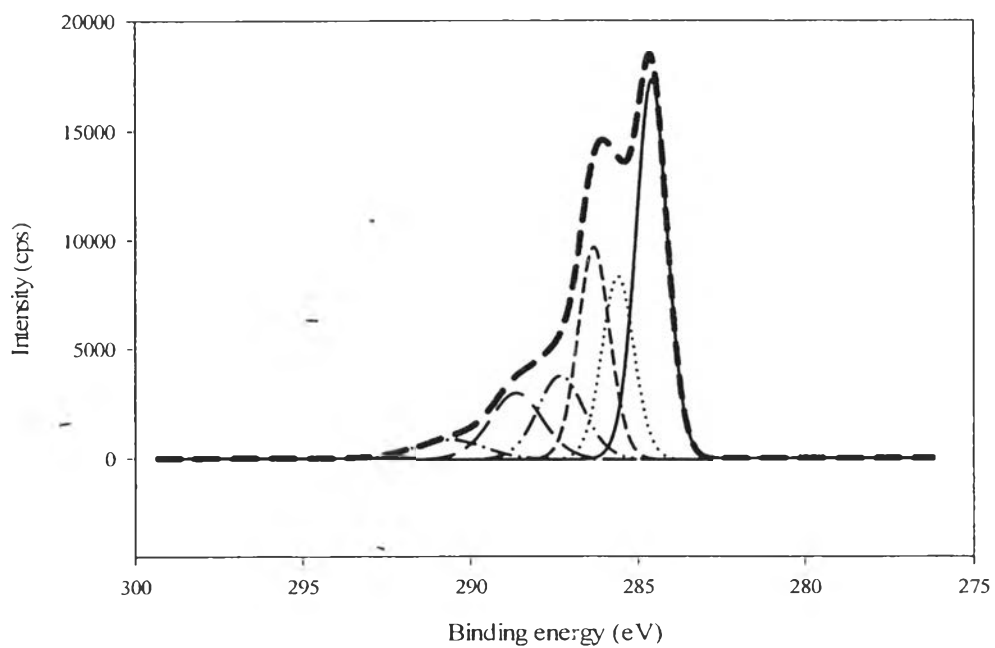
**Figure D8** C1s XPS spectra of OX/10/8.



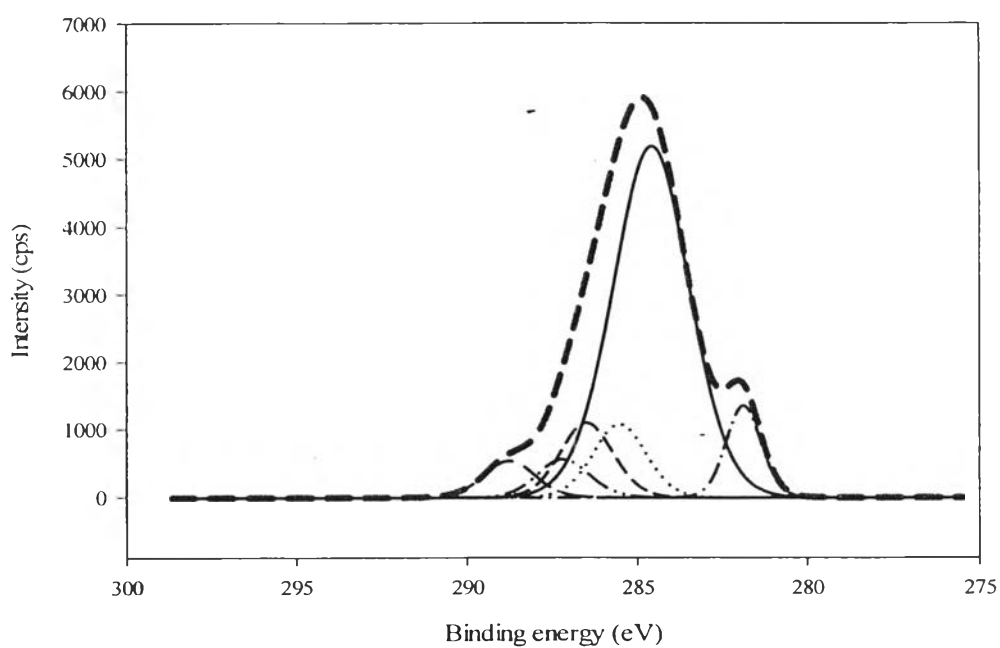
**Figure D9** C1s XPS spectra of OX/15/8.



**Figure D10** C1s XPS spectra of 10/OX/5/8.

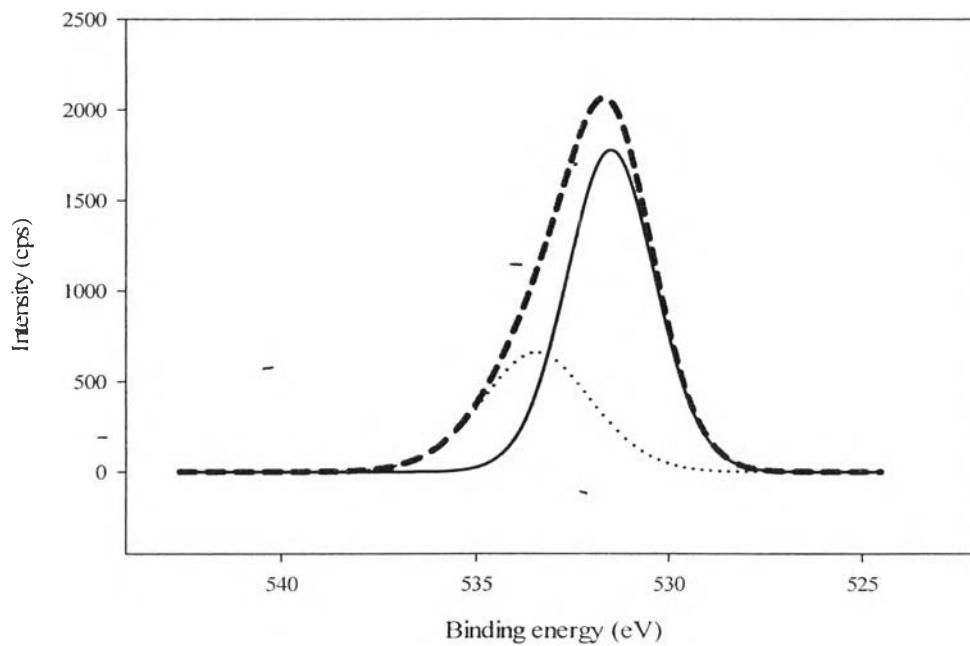


**Figure D11** Cls XPS spectra of 10/OX/10/8.

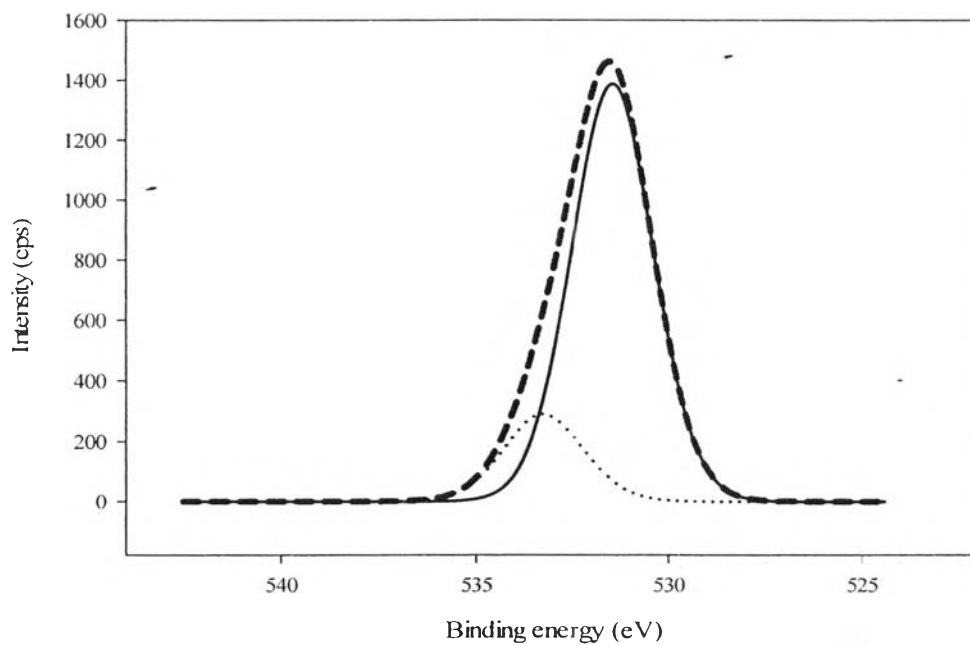


**Figure D12** Cls XPS spectra of 10/OX/15/8.

## Appendix E The Deconvolution of O1s XPS Spectra

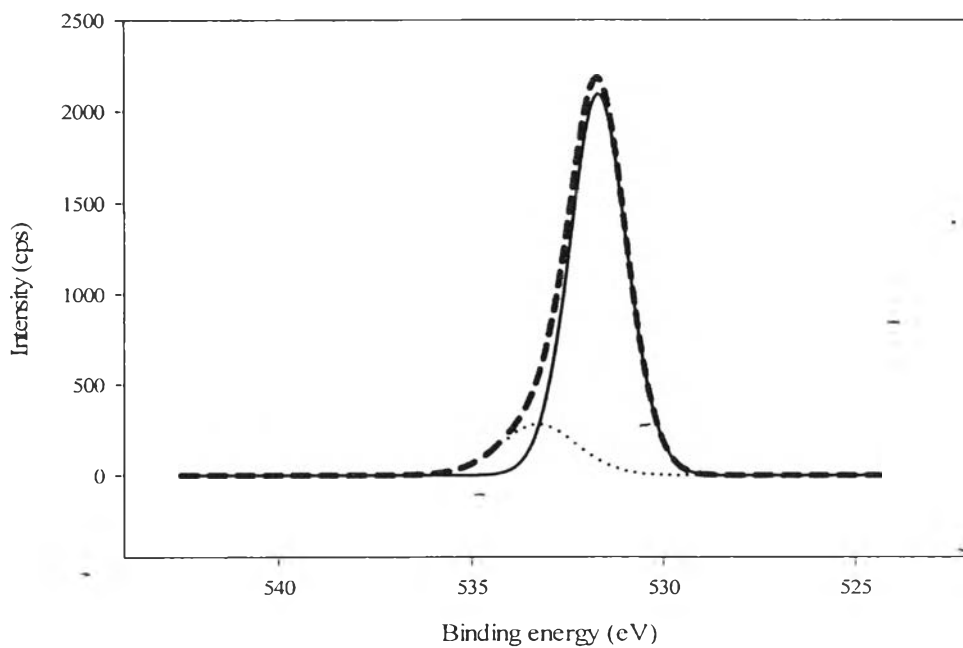


**Figure E1** O1s XPS spectra of AC.

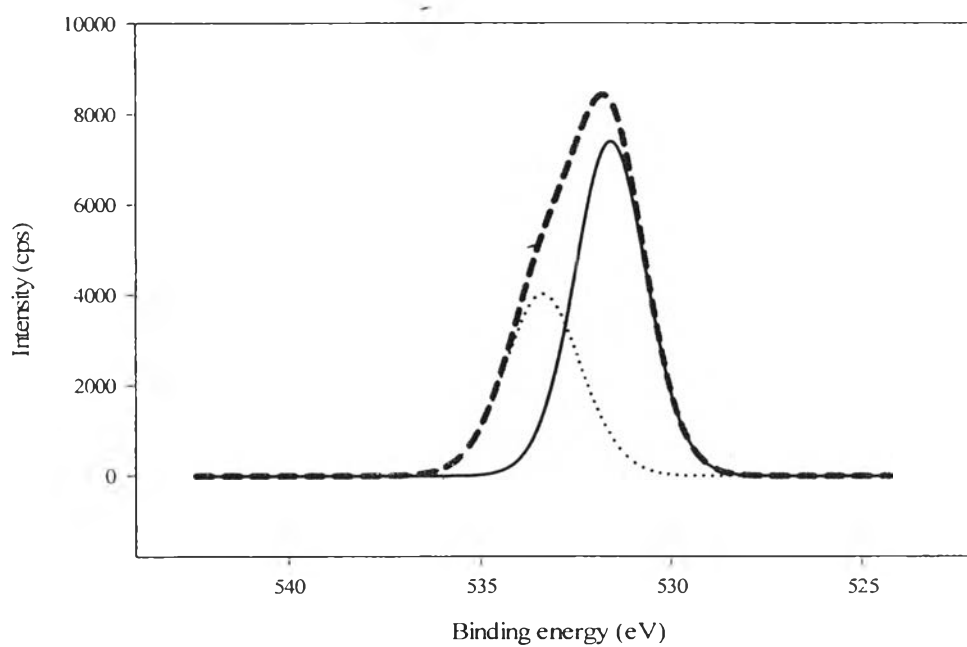


**Figure E2** O1s XPS spectra of 10/AC.

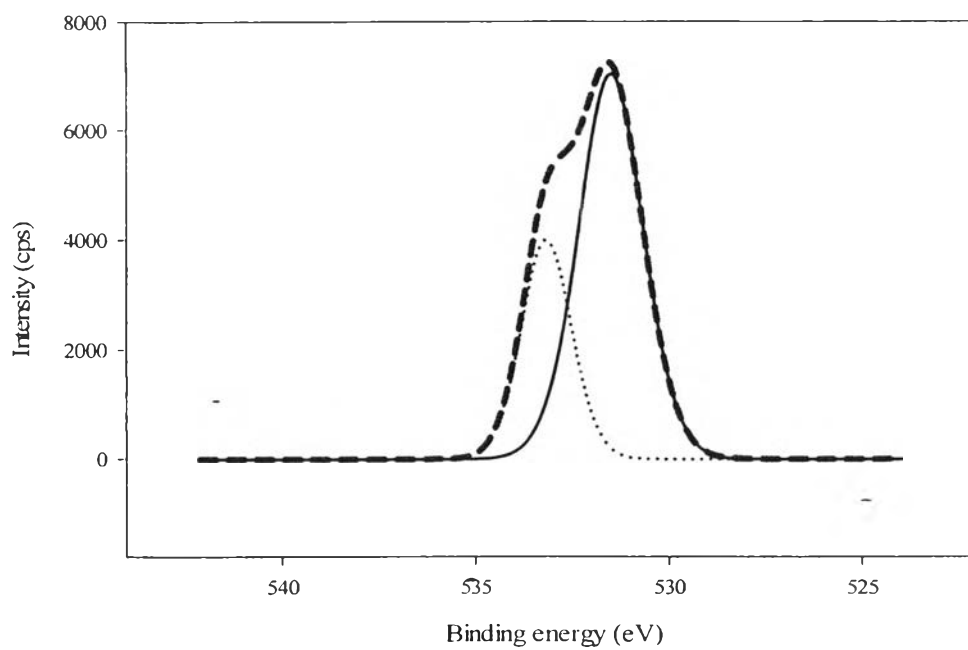




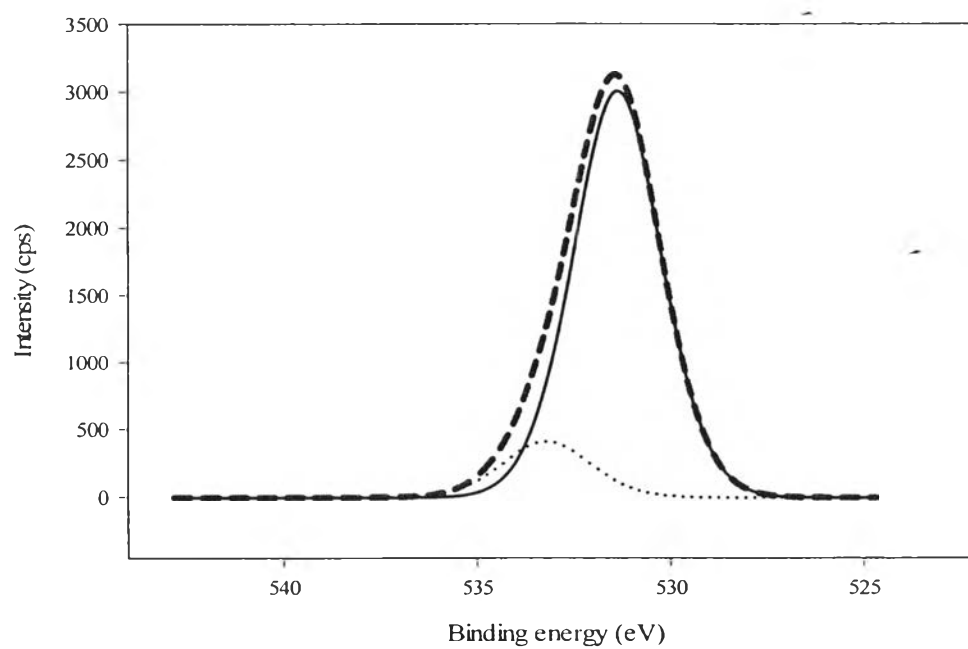
**Figure E3** O1s XPS spectra of 20/AC.



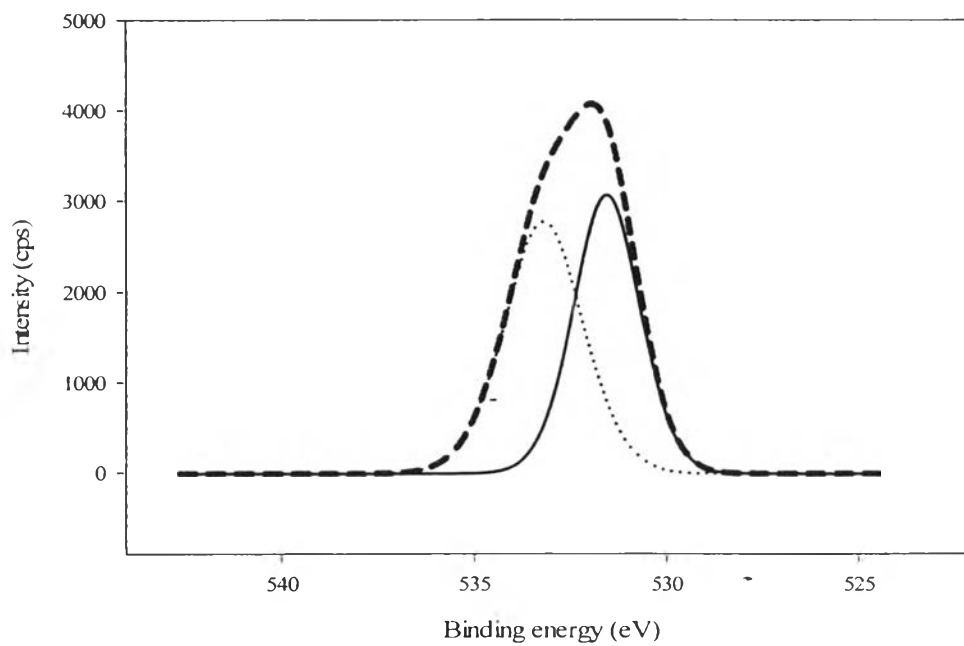
**Figure E4** O1s XPS spectra of 30/AC.



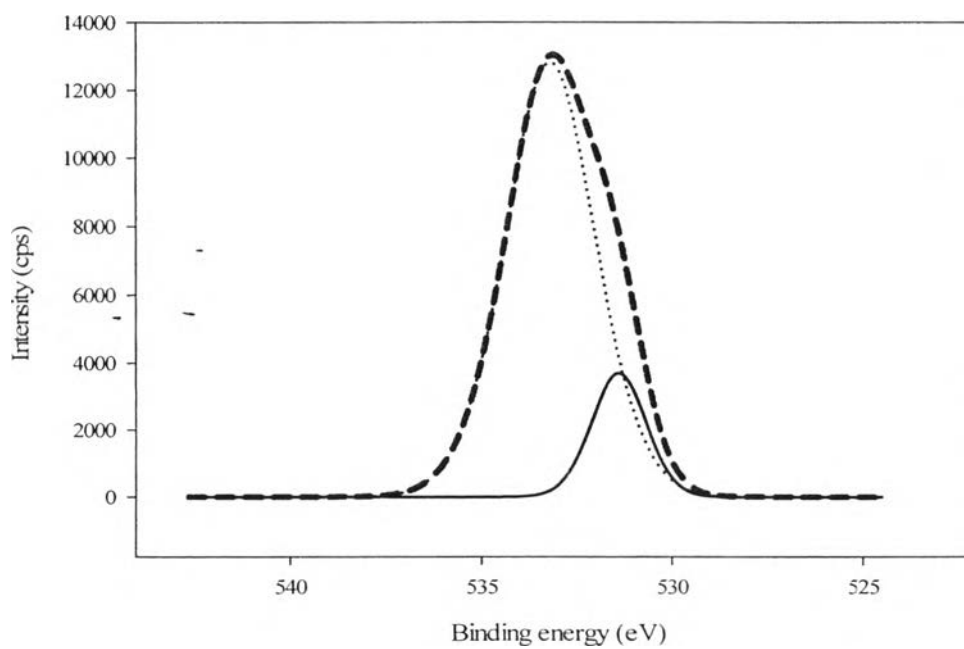
**Figure E5** O1s XPS spectra of OX/5/8.



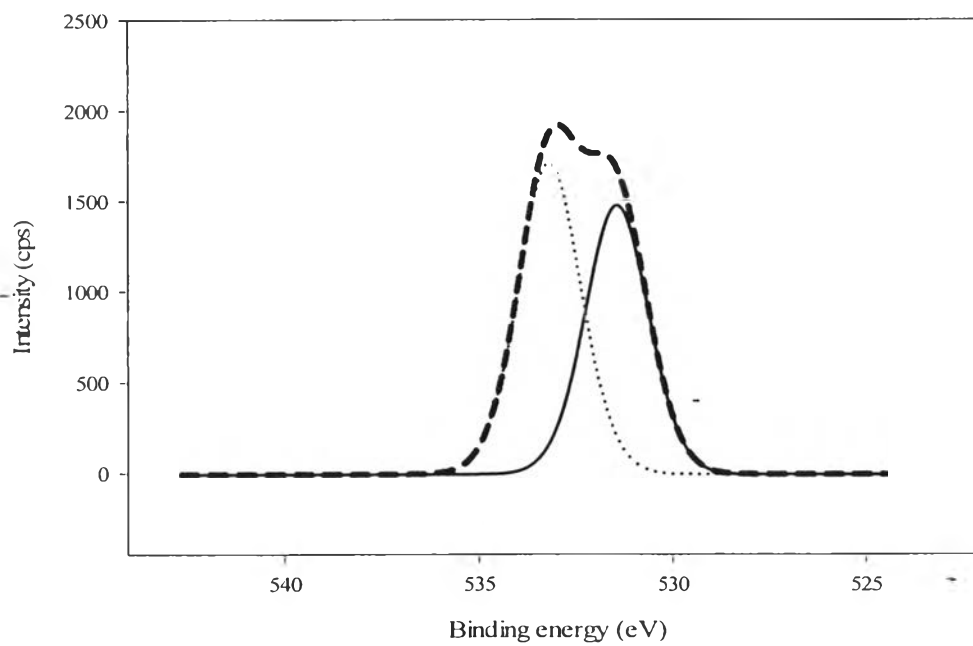
**Figure E6** O1s XPS spectra of OX/10/1.



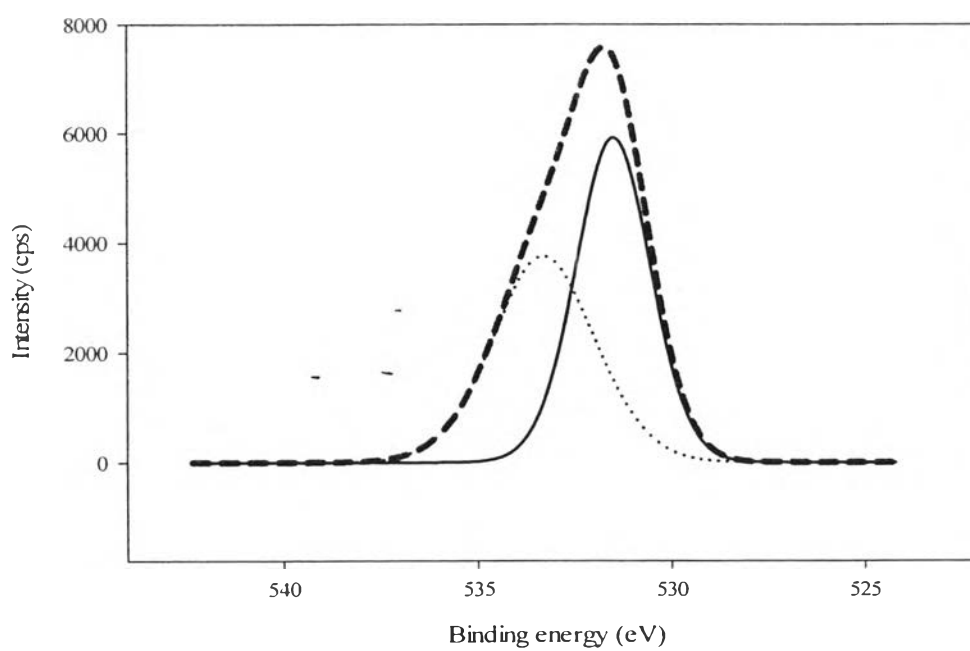
**Figure E7** O1s XPS spectra of OX/10/4.



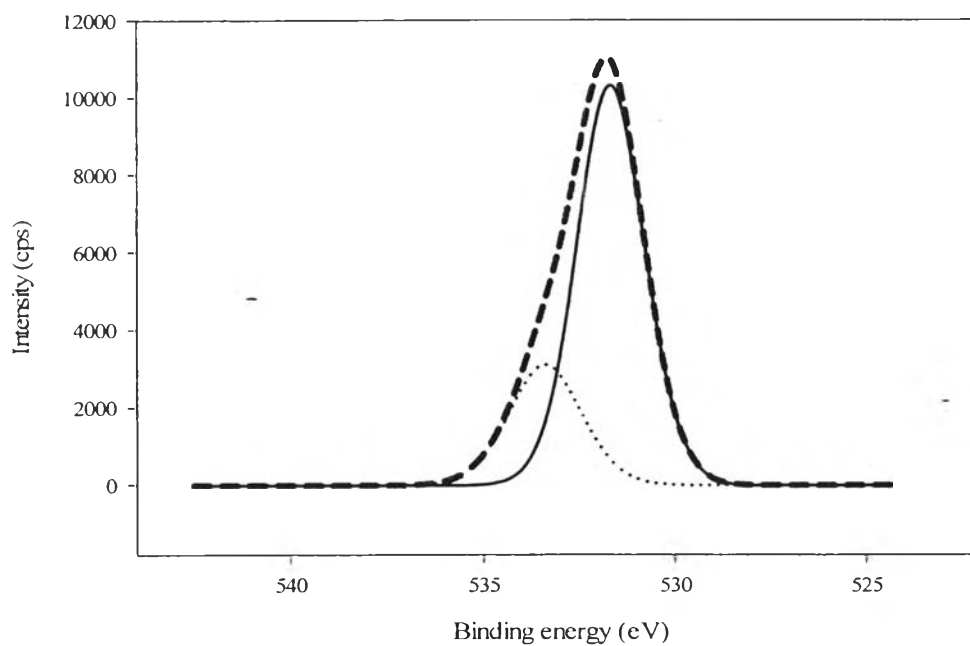
**Figure E8** O1s XPS spectra of OX/10/8.



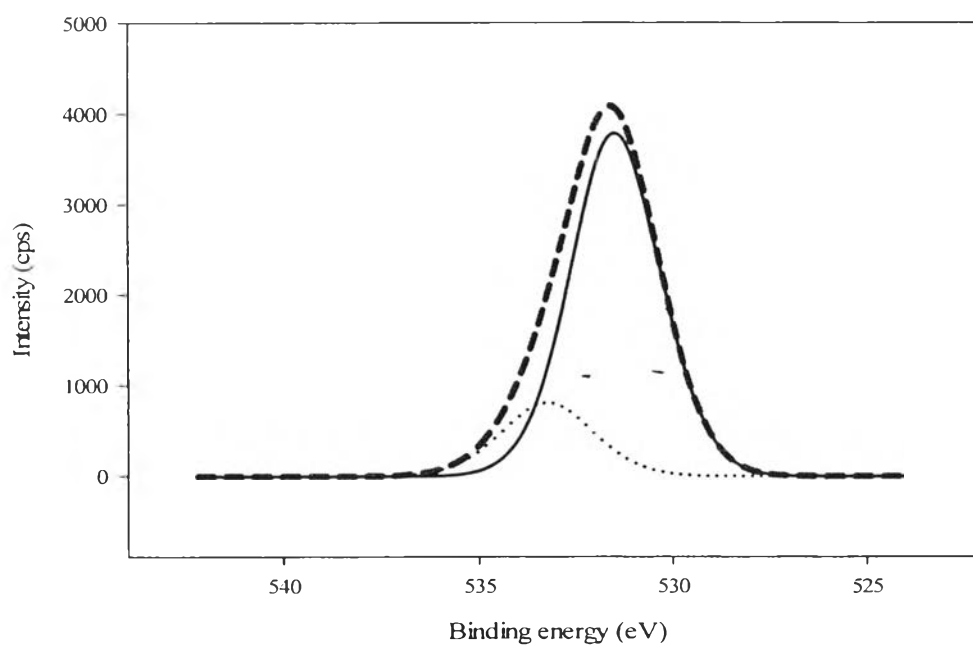
**Figure E9** O1s XPS spectra of OX/15/8.



**Figure E10** O1s XPS spectra of 10/OX/5/8.

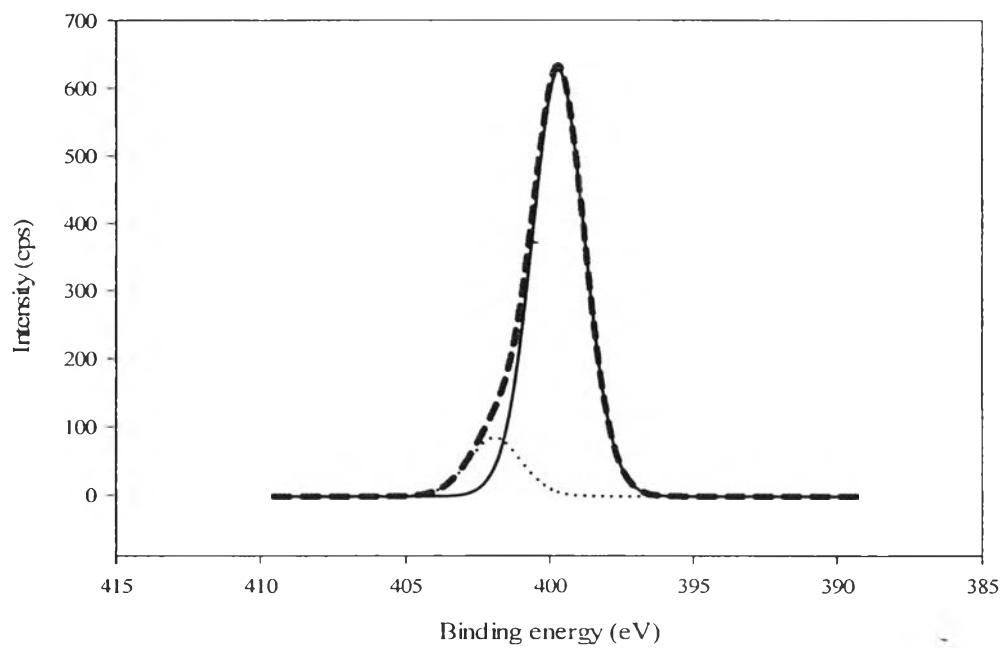


**Figure E11** O1s XPS spectra of 10/OX/10/8.

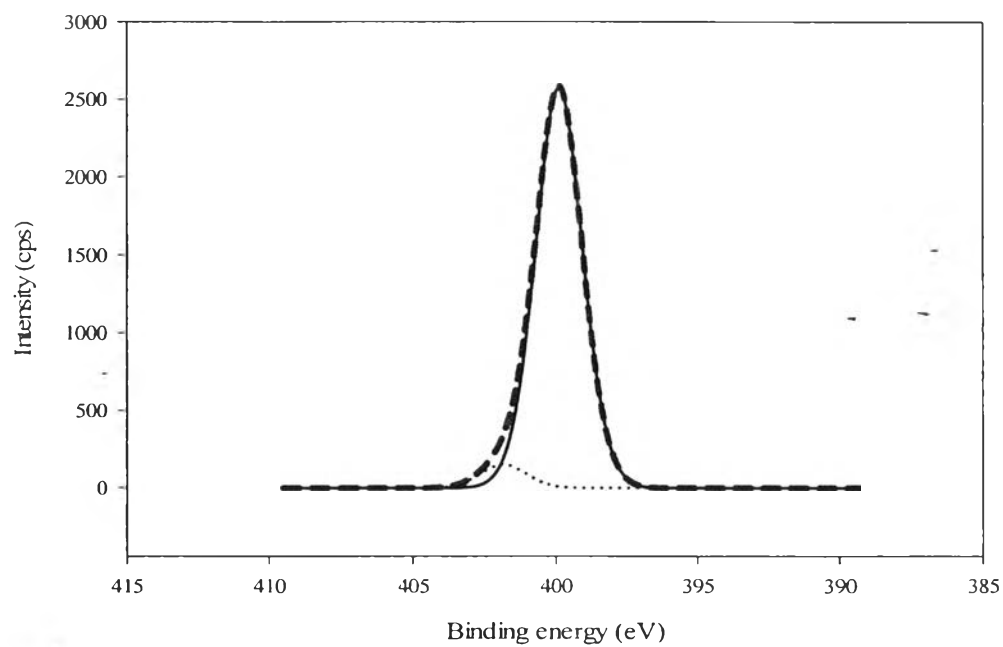


**Figure E12** O1s XPS spectra of 10/OX/15/8.

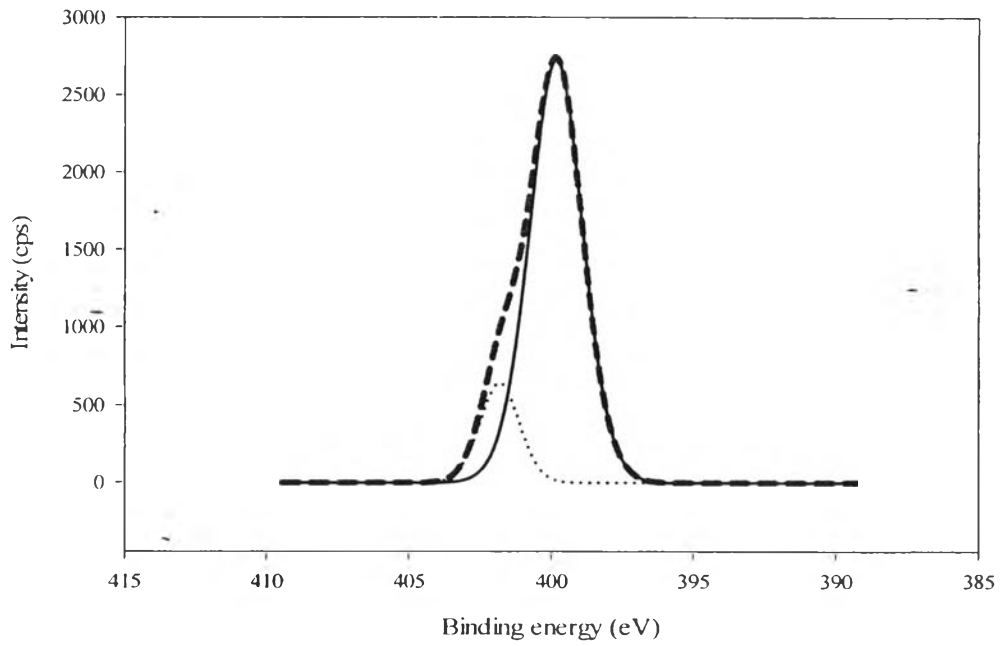
## Appendix F The Deconvolution of N1s XPS Spectra



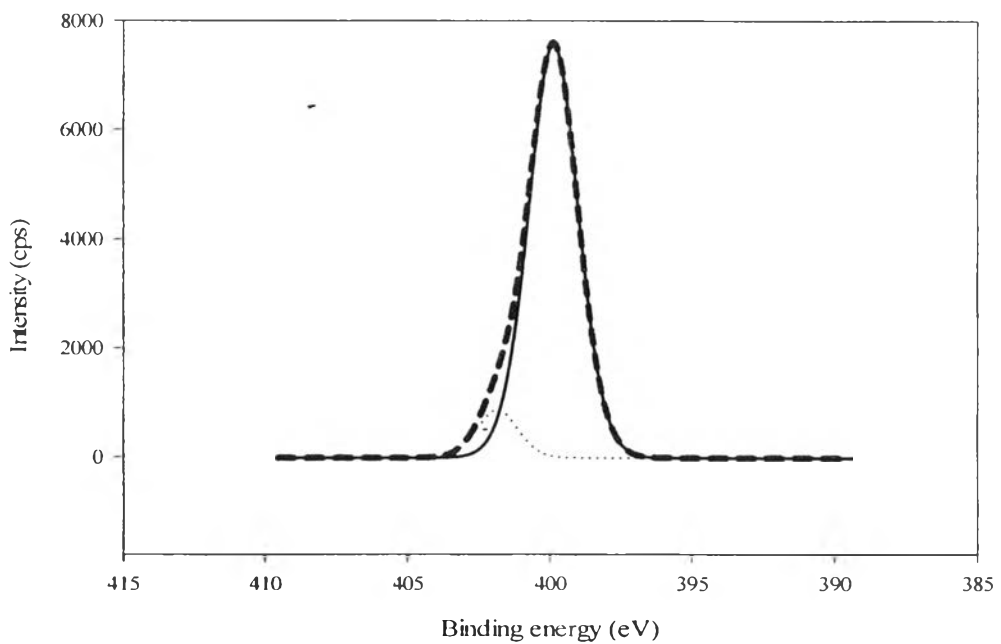
**Figure F1** N1s XPS spectra of 10/AC.



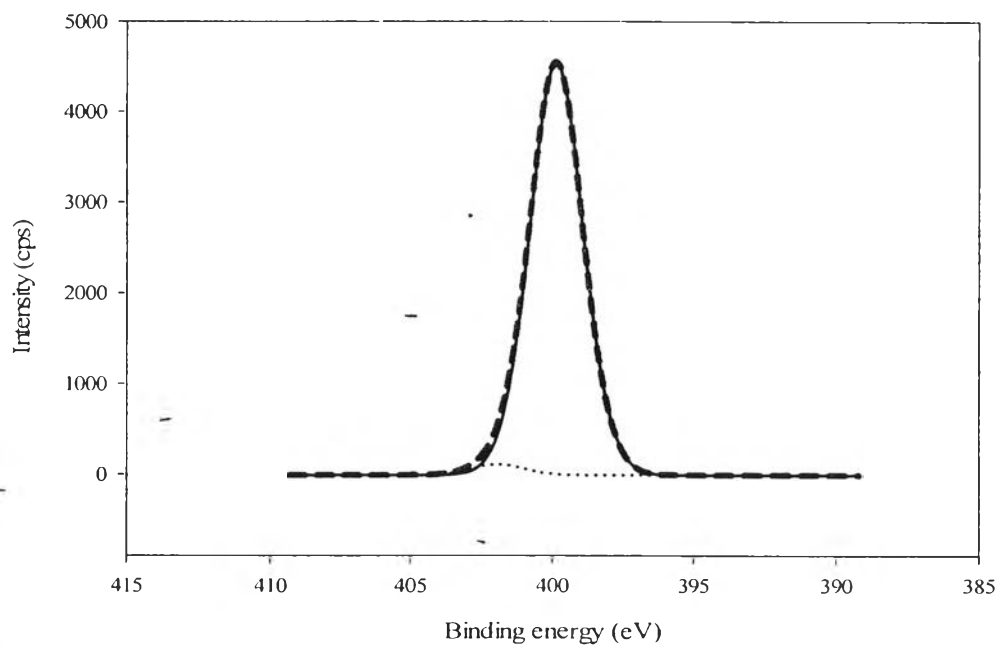
**Figure F2** N1s XPS spectra of 20/AC.



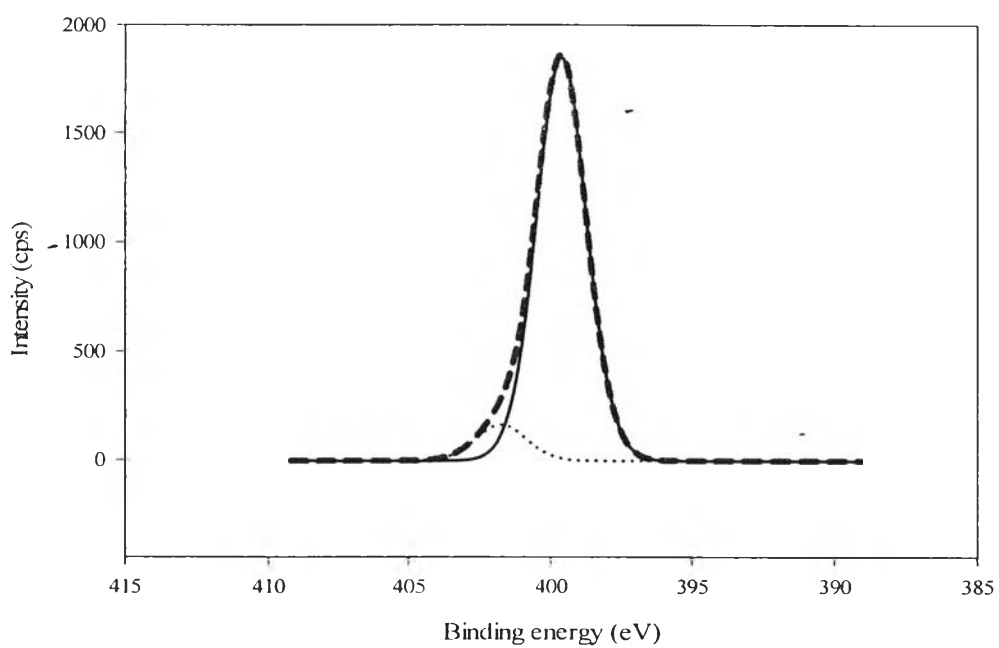
**Figure F3** N1s XPS spectra of 30/AC.



**Figure F4** N1s XPS spectra of 10/OX/5/8.



**Figure F5** N1s XPS spectra of 10/OX/10/8.



**Figure F6** N1s XPS spectra of 10/OX/15/8.



## CURRICULUM VITAE

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1. Surin, T.; and, Suriyapraphadilok, U. (2014, April 22) Influence of Oxidation and Nitrogen Treatment on Activated Carbon for CO<sub>2</sub> Adsorption. Proceeding of The 5<sup>th</sup> Research Symposium on Petrochemical, and Materials Technology and the 20<sup>th</sup> PPC Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.

**Presentation:**

1. Surin, T.; and, Suriyapraphadilok, U. (2014, May 7-8) Influence of Oxidation and Nitrogen Treatment on Activated Carbon for CO<sub>2</sub> Adsorption. Paper presented at International Conference on Environment and Renewable Energy, Paris, France.