Effect of chemical pretreatment on surface modification of carbon supports derived from Cattail flower

Parncheewa Udomsap¹,², Nuwong Chollacoop², Nilubon Jong-anurakkun³, Yuji Yoshimura⁴, Apiluck Eiad-Ua¹*

¹College of Nanotechnology, King Mongkut’s Institute of Technology Ladkrabang, Bangkok 10520, Thailand
²National Metal and Materials Technology Center, National Science and Technology Development Agency, Pathumthani 12120, Thailand
³Global Green Chemicals Public Company Limited, Bangkok 10900, Thailand
⁴National Institute of Advanced Industrial Science and Technology, Tsukuba 305-8565, Japan
*E-mail: apiluck.ei@kmitl.ac.th

Abstract: Carbon supports derived from Cattail flower as renewable biomass were prepared by hydrothermal carbonization process at 180°C for 8 hr then pyrolysis at 900°C for 2 hr under flow of N₂. The carbon supports were pretreated separately with various acids as activated chemicals including H₂SO₄, H₃PO₄, HNO₃ and HCl. The effect of chemical pretreatments on physical property of carbon was investigated by N₂ adsorption and desorption isotherm. The surface area of the pre-activated carbon was 586 m²/g with pore diameter 3.67 nm. The surface area of the support decreased to 345 m²/g after loading nickel metal via impregnation method. The chemical activation of the carbon support have positive impact on the physical properties. The improvement of the surface area of the carbon supports lead to high metal dispersion and increase the active site, which enhance the catalytic activity of the catalyst. Furthermore, the changes in morphology and structure of the activated carbons were also discussed.

Keywords: Activation carbon; Fibrous cattail flower; Hydrothermal; Carbonization; Carbon support