Effect of functional groups of activated carbon fiber on propylamine adsorption

Byeoung-Ku Kim, Burm-Ho Yang and Si-Mong Kim
KT&G Central Research Institute

The surface of activated carbon fiber (ACF) was modified by nitric acid to improve the adsorption efficiency for propylamines. Functional groups and textural properties of the modified ACF were investigated. The total acidity of surface increased about 7 times to that of as-received ACF by modification with 1M nitric acid, and carboxylic and phenolic groups were mainly increased. The specific surface area and the total pore volume of the modified ACF decreased by 5~8% due to the blocking of micropore by newly developed functional groups. In spite of the decrease of specific surface area and total pore volume, the amount of propylamine adsorption of the modified ACF was increased by 17%. Desorption of propylamine from the propylamine saturated ACF occurred in two steps, the first step was started at around 50°C showing the desorption of physically adsorbed propylamine and the second step was started at 200°C showing the decomposition of chemically adsorbed propylamine. Total amount of propylamine desorption from the modified ACF was larger than that of the as-received ACF because of increased functional groups. The oxygen and nitrogen contents on the modified ACF was increased by 1.5 and 3 times compared with the as-received ACF. A part of propylamine adsorbed on ACF formed a pyridine-like or pyrrolic structure with 2 carbons exposed on the surface of the ACF. The data also showed that propylaminesreact with strong or weak acidic functional groups such as -COOH or -OH existed on ACF surface.