Thermal Regeneration Characteristics of Respirator Cartridges for Two-component Organic Vapors

Hajime Hori, Toru Ishidao, Sumiyo Ishimatsu

University of Occupational and Environmental Health, Japan
Department of Environmental management, School of Health
1-1 Iseigaoka, Yahatanishi-ku
Kiyakyushu, Fukuoka 807-8555
Japan
E-mail: horih@med.uoeh-u.ac.jp

Breakthrough and thermal desorption characteristics of respirator cartridges that adsorbed two-component organic vapors were studied experimentally to develop regeneration method of the cartridges. The vapors were introduced into a respirator cartridge for organic vapors (Shigematsu Works, CA-104NII), and the breakthrough curve was obtained by a gas chromatograph equipped with a flame ionization detector (GC-FID). In the adsorption cycle, two kinds of vapors did not begin breakthrough simultaneously because of different adsorption affinity to charcoal. When the cartridge reached the breakthrough time of a component with the shorter breakthrough time (1st component), vapor supply was stopped and the desorption cycle was started by supplying clean heated air continuously at the temperatures of 65°C and the flow rate of 20 L/min. When the vapor concentration of the first component in downstream of the cartridge became below a detection limit, desorption cycle was stopped. This adsorption-desorption cycle was repeated at least 10 times, and the effect of the number of adsorption-desorption cycles on the breakthrough time was investigated.

For methanol-toluene system, methanol began breakthrough first in the adsorption cycle and it desorbed within 1 hour in the desorption cycle. The breakthrough time of methanol tended to become shorter when the adsorption- desorption cycle was repeated, but it became almost constant when the cycle was repeated greater than 5 times. Similar results were obtained for methyl acetate - toluene and methyl acetate - isopropyl alcohol systems. These results suggest that thermal regeneration of cartridges for organic vapors is possible for two-component vapors although the method needs more consideration.