

Respiratory Cartridge Service Life: the Use of a Modified Version of the Wood's Approach

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It is well known that the respirator cartridges for organic solvent vapors have a limited service life. While waiting for the development of service life indicators, it is recommended the use of theoretical models to estimate the cartridge service life. One of the most used models is the modified Wheeler-Jonas equation used in the Wood's approach. In this study, experimental data (breakthrough curves and activated carbon characterization) were obtained from six different respirator cartridges and ten different solvents selected to cover a broad range of solvent vapor pressures. The carbon vapor capacity for each respirator cartridge model was obtained by weighing the cartridge before and after each test. It was found that the amount of vapor adsorbed on the activated carbon (in terms of solvent volume) can be correlated with the Langmuir equation to the vapor relative pressure. Furthermore, the carbon micropore volumes were determined by using the Dubinin-Radushkevich (DR) equation. From the micropore volume data obtained with the DR equation and using the Wheeler-Jonas equation, breakthrough times were calculated and compared to the experimental results obtained for the 60 solvent-cartridge combinations. Breakthrough times were also calculated using the Wood's approach. Results showed that a better correlation is obtained between the calculated and the experimentally obtained results of breakthrough times using the modified approach proposed in this study.