

Tabernacka, A., Zborowska, E., Lebkowska, M. Removal of Chlorinated Ethenes (TCE and PCE) from the Air by Using Integrated Bioreactors with Immobilized Biomass. *Ochrona Srodowiska* 2012, Vol. 34, No. 3, pp. 11–18.

Abstract: Waste air polluted with chlorinated ethenes – trichloroethene and tetrachloroethene – was treated using integrated bioreactors which contained the following: a consortium of microorganisms with the ability to degrade pollutants, and porous sorbents, polyurethane foam and perlite, with immobilized biomass. Phenol in a biogenic salt medium was used as the carbon source for microbial growth. During the first 25 days of the process, when the pollution load of the bioreactors amounted to 2.57 g/m³h (TCE) and 1.04 g/m³h (PCE), removal efficiency was very high, ranging from 85 to 91% (TCE) and from 61 to 92% (PCE) in the reactor where biomass was immobilized on perlite; in the reactor with biomass immobilized on polyurethane foam, removal efficiency varied from 79 to 93% (TCE) and from 78 to 94% (PCE). The rise in the PCE loading of the bioreactors to 2.73 g/m³h on the 54th day (while the TCE loading remained unchanged) produced significant inhibition of the air purification process. Reinoculations of the sorbents with bacteria able to degrade pollutants failed to provide the treatment effect desired. Polyurethane foam was found to be a better sorbent for biological removal of trichloroethene and tetrachloroethene from the air, which should be attributed to a noticeably greater number of bacteria active in degrading pollutants, and also to the evidently higher enzymatic activity of the biomass, as compared with perlite.

Keywords: Bioreactor, air treatment, trichloroethene, tetrachloroethene, enzymatic activity.