

繊維状活性炭に担持した二酸化チタン光触媒 脱臭システムの開発

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概 要

繊維状活性炭に二酸化チタン光触媒を担持させたシート材 (TiO₂/FACシート) を用いた脱臭試験装置で, 気相からの悪臭物質除去速度の解析および悪臭物質の酸化生成物の定量を行った。光源には主波長365nmおよび254nmの二種類の紫外線ランプを使用した。TiO₂/FACシートおよび光照射の有無によって異なる系を作り, 吸着, 光分解, 光触媒分解によるアンモニア, 硫化水素, メチルメルカプタンの除去効果を調べた。TiO₂/FACシートへの吸着効果は大きく, メチルメルカプタンについては, 除去速度から光触媒分解の効果が見られた。また, アンモニア, メチルメルカプタンの酸化生成物である硝酸, 硫酸をそれぞれ定量したところ, 光触媒反応によって酸化分解されることが分かった。メチルメルカプタンについては, 254nmの光照射のみでも分解反応が進行し, 光源の主波長によって悪臭物質の除去特性に違いが見られた。

Development of Deodorization System Using Titanium Dioxide Photocatalyst Supported on Fiber Activated Carbon

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Abstract

Removal rates of malodorants from the gas phase and oxidation products were determined in a deodorization system using a sheet material with titanium dioxide photocatalyst supported on fiber activated carbon (TiO₂/FAC sheet). Two kinds of light sources, whose dominant wavelengths were 365 nm and 254 nm, respectively, were used in this study. The removal rate constants of malodorants such as ammonia, hydrogen sulfide, and methyl mercaptan from the gas phase were determined in the presence or absence of the TiO₂/FAC sheet and UV-irradiation in order to study each removal effect due to adsorption, direct photolysis, and photocatalysis. The effect of adsorption onto the TiO₂/FAC sheet was pronounced. The photocatalytic effect was observed from the removal rate constants of methyl mercaptan. The oxidation of ammonia to nitrate and that of methyl mercaptan to sulfate were examined by determining these products. The formation of nitrate and sulfate was progressed in the presence of both the TiO₂/FAC sheet and UV-irradiation, i.e., by photocatalysis. Methyl mercaptan was also oxidized to sulfate without the TiO₂/FAC sheet in irradiating the light with wavelength of 254 nm. This indicates that the decomposition characteristics of malodorants were dependent on the wavelengths of the light source.