Title Enhanced photocatalytic disinfection of *P. expansum* in cold storage using a TiO_2/ACF film

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Abstract

Spores of *Penicilliumexpansum* are the most important airborne component of fungal contamination and are commonly present in the moist air in cold storage rooms where fruits and vegetables are stored. To improve the ability of activated carbon felt-supported titanium dioxide (TiO_2/ACF) to remove spores of *P. expansum* from the atmosphere, measurements for the removal efficiency of the spores at a temperature of 3 °C ± 1 °C and relative humidity of 90% ± 3% had been made on photocatalytically-activated (PC) silver-doped TiO_2/ACF prepared by ion sputtering in two different modes and photoelectrocatalytically-activated (PEC) TiO_2/ACF films. The Weibull distribution model was used to define the degree of microbial inactivation attributable to the PC or PEC films. The key parameters of the PC or PEC affecting the disinfection efficiency in terms of the reliable life (t_R value) of this model were studied. Both silver-doped TiO_2/ACF and PEC on TiO_2/ACF improved destruction of this airborne microbe. Silver deposited on the surface of the prepared ACF-supported TiO_2 films (Ag/Ti = 0.012, atomic ratios) dramatically reduced t_R value. With respect to the PEC, a model was established using response surface methodology to describe the relationship between the t_R value and the key affecting parameters, including light intensity and bias voltage. The optimized parameters were found to be a light intensity of 2.3 $mW \cdot cm^{-2}$ with a bias voltage of 66.7 V.