Topics

Development of Photocatalytic TiO_2 Coated Curtain

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1. Introduction

The titanium oxide (=titania) photocatalyst has attracted attention as a way to degrade pollutants at ordinary temperature using ultraviolet light irradiation. At this laboratory, we had already discovered the odor decomposition-elimination activity of the photocatalyst[1)] and introduced a photocatalyst air-purifier for practical application. We have also found environmental hormone elimination performance in the photocatalyst and are discussing application for environmental purification[2)]. We have now developed curtain provided with photocatalysis function as part of application of photocatalyst to the housing member.

When supporting the photocatalyst on curtain material and other organic fibers, deterioration of the curtain material by the photocatalyst presents a problem. Recently, in order to solve this problem, Teraoka et al. reported the coating of the titania particles with apatite[3)]. We have studied an original method using photocatalytic particles consisting of titania and silica. The following is a summary of this method.

2. Supporting of silica particles containing titania

As **Fig. 1**(a) shows, we used the secondary particles having a structure where silica particles surround the crystalline titania particles as the photocatalytic particle. In addition to this photocatalytic particle, to provide it with adhesion to the fabric, we dispersed an acrylic binder in the water and immersed the polyester curtain in the solution. We then dried the fabric at 105ºC to obtain the photocatalytic curtain with supported photocatalytic particles on the fabric[4)].

Next, we examined the photodegradation reaction of acetaldehyde using this curtain. A 20L gas mixture containing 20ppm acetaldehyde and 20% oxygen <balance nitrogen> was circulated at the rate of 5L/min and the acetaldehyde concentration in the system was measured 40 minutes later (**Fig. 2**). When irradiated by light, the concentration dropped due to the photocatalytic effect (Fig. 2(b)). However the concentration decreases even without irradiation (Fig. 2(a)), which was caused by adsorption on the curtain. In addition, when we evaluated the acetaldehyde circulation similar to the above-mentioned again after irradiating with light equivalent to one year of sunshine with a weather meter, the photocatalytic activation further improved (Fig. 2(c)). We assume that this was caused by the irradiation that removed the acrylic binder on the surface of the photocatalyst by decomposition through photocatalysis. As a result, a clean surface of titania appeared (Fig. 1(b)-->(c)). On the other hand, since no light reached the fabric side of the photocatalytic particle, the binder present between the photocatalytic particle and the fabric remained unaffected, thus retaining the adhesiveness of the photocatalytic

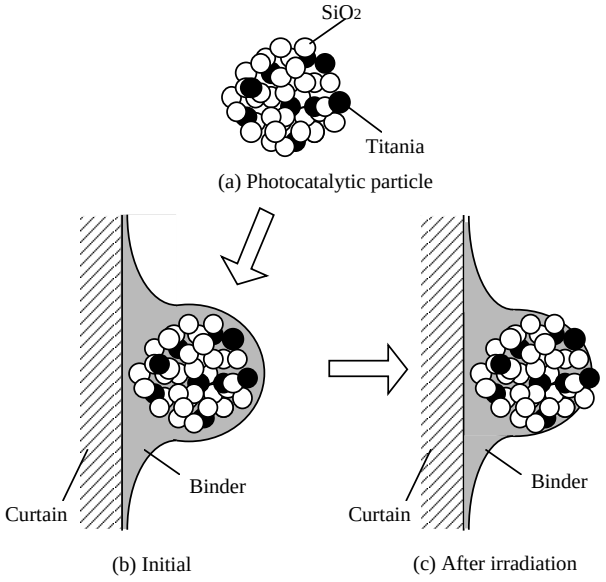

Fig. 1 Photocatalytic particle (a) and surface condition of curtain coated with the particles in initial (b) and after sunshine weather meter irradiation (c).

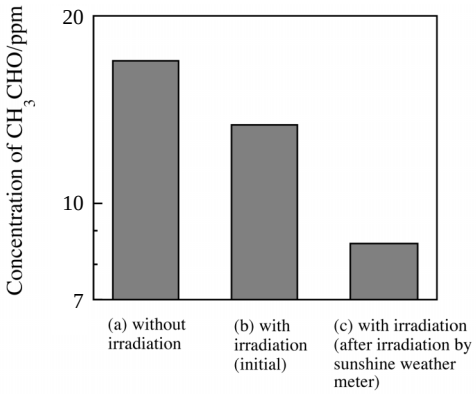

Fig. 2 Concentration of Acetaldehyde after circulating experiment (5L/min x 40min, initial conc. of Acetaldehyde = 20ppm).

particle to the fabric.

The toughness for washing, the softness when touching are also important factors in curtain. We have experimented on these factors and mostly cleared up for general use.

References

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