

Applications for Air Purification and Antibacterial/Antimold/Antifouling Coatings

We developed a multifunctional composite material with a titanium dioxide surface covered by apatite for application in air purification and as an antimicrobial, antifungal, and antifouling coating. This composite material has the following characteristics; (1) the apatite adsorbs materials even without exposure to light; (2) materials adsorbed by the apatite are decomposed by the titanium dioxide photocatalyst on exposure to light; (3) the apatite is used as a spacer, allowing blending of the material with resins, organic coatings, and other organic materials; (4) even though the photocatalyst requires a fixed period to decompose organic materials, the capture of materials by the apatite ensures decomposition.

When this composite material was applied to artificial decorative plants, we created a unique environmental improvement system which performs efficient environmental purification. Indoor air was monitored, a ventilation fan function was checked, the required surface area of the artificial decorative plants was calculated from the air volume to be treated, and the artificial decorative plants were installed. After several weeks, the effect was measured and environmental improvement results were determined.

The apatite-covered titanium dioxide coating developed jointly with Marutake Sangyo (Ltd.) has superior transparency and durability. This coating dried and adhered at ambient temperature in approximately two hours (conforming to Food Hygiene Law specifications for safety testing of utensil and container packaging). Mold developed in approximately two

days in closed non-coated polystyrene containers left at room temperature filled with items such as rice cakes and bread, but no mold developed in apatite-coated containers even after one week. This experiment was performed with containers left at room temperature without exposure to light, showing that bacterial and other reproduction can be prevented through the use of apatite adsorption, even without exposure to light.

In building material applications, conventional coatings using only titanium dioxide require the application of an inorganic undercoating to protect the substrate, a process requiring two days or longer. The ability to directly apply Apatatek allows the completion of the process in half a day. Comparison of coating with titanium dioxide alone versus coating with apatite-covered titanium dioxide clearly demonstrated that the antifouling effect was greater in the latter case including an apatite covering. The effect is also obtained in the coating of guard rails, signs, and automobile bodies.

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AIST Today Vol. 2, No. 3
(2002) 17



Antifouling effect