Fullerene doubles durability of photocatalyst coating material

RIKEN and TORAY Industries jointly have developed a new technology that doubles the performance and durability of photocatalyst-coating products based on photocatalyst materials such as titanium oxide using a fullerene. This research was carried out by the Integrated Materials Research Laboratory (laboratory head: Dr. Tomoya Yamashiki) established within the RIKEN Center for Intellectual Property Strategies under the "Integrated Collaborative Research Program with Industry", in which businesses and RIKEN work together in an integrated manner.

Photocatalyst materials are activated upon being irradiated with light to decompose organic material and prevent contamination. Many photocatalyst materials are particulates ranging in size from a few to some ten nanometers (nm), and, in actual applications, are uniformly mixed with a polymer called "binder polymer" to fix the photocatalyst material to the surface to be coated. However, photocatalyst materials have such a strong catalytic action when irradiated with light that the binder polymer (a part of photocatalyst coating material) is decomposed, significantly degrading the coating layer.

In an effort to solve this problem, the research team has been investigating methods of distributing and mixing fullerenes in photocatalyst coating materials and controlling the degradation of the binder polymer in order to develop the fullerene-based photocatalyst degradation control model proposed by TORAY. Specifically, we developed technology that effectively and uniformly distributes and mixes fullerene derivatives developed by Dr. Yusuke Tajima, a senior research scientist at the Nanomaterial Processing Laboratory, and photocatalyst particles in an acrylic polymer, which is a type of general-purpose binder polymer. Furthermore, we investigated the effect of adding the fullerene derivative on controlling the deterioration of the photocatalyst coating material,
and confirmed a significant improvement in the life of the photocatalyst coating material - at least twice that of existing materials. Also, TORAY confirmed that this technology could be applied to existing textile processes. If a textile is coated with a photocatalyst material, antibacterial and deodorizing effects can be expected. This technology allows for the improvement in the durability of photocatalyst-coated textile products, with the range of applications expected to expand significantly in textiles such as clothing, carpets, and curtains.

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