Photo-catalytic, self cleaning coating for building exteriors

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Imagine the exterior of your house always looking good, without cleaning or giving it a new coat of paint. This is now possible with paint that can maintain itself and get rid of accumulated dirt on its own.

A process for producing photo-catalytic, self-cleaning coatings has been developed by scientists at Singapore's A*STAR (Agency for Science, Technology and Research), and licensed to Haruna (S) Pte Ltd.

The patented process produces a coating containing the nano-particle, titanium dioxide (TiO_2).

When exposed to an ultraviolet light source, such as the sun, the coating's oxidative property decomposes organic substances such as microbes on its surface.

In addition, the hydrophilic nature of the coating causes water that comes into contact with it to form an even layer, thereby allowing the dust and dirt that have accumulated on the surface to be washed away. These two properties of the coating create the "self-cleaning" effect.

The self-cleaning coating technology, developed at the Singapore Institute of Manufacturing Technology (SIMTech), a research institute under A*STAR, is applicable for use on painted surfaces.

Such coatings will greatly benefit building maintenance, especially for skyscrapers, since they reduce the need for costly surface cleaning.

With the novel coating technology, the surface of buildings can remain clean longer, compared to surfaces without the coating.

In Singapore, the surface of a typical commercial building is washed at least once a year. For some shopping malls, exterior washing is as frequent as once a quarter. Every wash costs between $10,000 to $50,000 (Singapore currency), depending on the size of the building.

A*STAR's coating technology is set to reduce the frequency of washes and correspondingly, drive down the cost of building maintenance. Because water is also saved in the process, this self-cleaning technology translates to a more environmentally friendly method to keep buildings clean in a skyscraper-filled metropolis.

Additionally, physical cleaning, usually using strong detergents or high-pressure water jets, can cause damage to the building materials. The same materials when treated with the photo-catalytic self-cleaning coating can last longer. This naturally leads to lower maintenance cost.

Haruna has started mass production of the self-cleaning coating. The company is already experiencing some market success by having applied the new coating technology on commercial buildings.

For example, Pacific Plaza (owned by Far East Organisation), located near Scotts Road in Singapore, is one building with the self-cleaning coating.

On signing of the licence agreement, Boon Swan Foo, Executive Chairman of Exploit Technologies, said, "We are delighted to grant the scale-up licence for A*STAR's photo-catalytic coating technology to a home grown company like Haruna. We are confident of the technology's market potential, and Haruna's first clients reinforced our original assessment. Given the technology's versatility, the market can expect to

see more of it in different application areas soon. Such innovation can spark new opportunities for Singapore companies to re-define the playing fields of mature industries, both locally and overseas."

Director of Haruna Yukio Yanase added, "Haruna has always strived to be an innovative and science-based company. By incorporating A*STAR's novel process of using the photo-catalytic technology in our business, we are convinced that Haruna is on the way to yet another market success with this new self-cleaning coating."

Exploit Technologies Pte Ltd signed the licence agreement with Haruna (S) Pte Ltd at the TechLicensing Fair 2008: Energy & Environment, on 20 Nov. 2008.

At the same event, SIMTech also signed a collaboration agreement with Haruna (S) Pte Ltd to work together on fine-tuning the production process for full commercialisation of the photo-catalytic coating technology.

More about PHOTOCATALYTIC SELF-CLEANING COATING:

Dirt collection (accumulation) in building exteriors have poised considerable problems for building maintenance. Cleaning such building surface is generally done by using detergents accompanied with scrubbing, wiping and high-pressure water jet. These processes have several shortcomings such as use of chemical detergents, high consumption of energy and labour cost. These naturally lead to high maintenance cost; therefore, an effective self-cleaning coating is desirable.

In recent years, "self-cleaning" coating using photocatalytic Titanium Dioxide (TiO_2) has gained considerable industry attention. With assistance of little UV light from fluorescence source or sunlight, TiO_2

offers two unique properties: (a) strong oxidation power, and (b) super-hydrophilicity.

Strong oxidation power can be used to kill bacteria attached on the wall, or oxide/remove foul smell from stains in toilet (e.g., TiO2-coated tile and TiO2-coated glass are commercially available). Super-hydrophilic property can allow dirt and stains to be easily washed away with water or by rainfall when such coating is applied to exterior surfaces. However, due to its strong photoreactivity, TiO2 coating cannot be coated directly onto an organic paint surface because this will attack the paint surface, causing the so- called paint-chalking phenomenon. This factor has limited the applications of TiO2 coatings.

The present invention provides a highly novel and effective technique for providing an inorganic-organic layer to serve in between a painted surface and TiO2 coating to avoid the effect of paint-chalking. This interlayer functions as a binder TiO2 particles and as well as a barrier to prevent substrate-damage from the photocatalytic reaction. Using this approach, continuous and sustained self-cleaning effects can be realized on the surface of painted panels.

POTENTIAL APPLICATIONS:

-- Commercial buildings (hotels, shopping malls, offices, convention centres).
-- Heritage buildings / conservation projects
-- Educational institutes

ADVANTAGES:

-- Maintenance-free if the surfaces are being coated.
-- Environmentally friendly technology.
-- Reduce maintenance cost and efforts.

Source: Agency for Science, Technology and Research (A*STAR), Singapore