OptiClean

Platform for Creating Innovative Photocatalytic Cleaning Devices

Air & Water Purification/Extend Shelf Life of Organics

OptiClean™ enables a host of new air/water purification and organic-preservation innovations.

APPLICATIONS

OptiClean enables a variety of purification and preservation products.

- **Passive fluorescent diffusers become active air cleaners:** Stray UV light from fluorescent bulbs can penetrate an **OptiClean** diffuser to cleanse the air when the lights are on.
- **New PCO purifier designs:** **OptiClean** purifiers can have PLA tubes inner-coated with TiO_2 for UV-source isolation from the sterilized medium.
- **Fruits, vegetables, & flowers stay fresh longer:** Freshly harvested organics release ethylene gas that accelerates ripening during shipping. **OptiClean** packaging will neutralize the ethylene via sunlight or UV activation, thus improving freshness and extending product shelf life.

The air purification market is projected to reach $3 billion in the US alone in 2015 (IBIS World, 2015). Statistics are staggering—60 million Americans have nasal allergies, 26 million have asthma, and 1 in 5 smoke. Indoor air quality and sick-building syndrome blanket the news while people spend 90% of their time indoors.

A variety of purification platforms exist including ultraviolet irradiation, filtration, activated carbon, photocatalytic oxidation, ionization, and ozone treatment. Water purification solutions cost over $10 billion annually in the U.S. and utilize similar cleaning techniques. No single purification method can address every market need. Photocatalytic oxidation (PCO) is emerging as a purification platform, where ultraviolet light strikes a photocatalytic compound like titanium dioxide to create hydroxyl radicals and super-oxide ions which react with contaminants in air or water. Current PCO systems require UV light to directly strike titanium-dioxide-coated substrates, which limits device design and innovation.

Biovation's OptiClean technology provides an entirely new platform for PCO-based air and water purification. OptiClean uses novel biopolymers like polylactic acid which, unlike most petrochemical-based polymers, are UV transparent.

OptiClean allows the UV light to penetrate through the biopolymer to strike the backside of a nanophotocatalytic film to "back-activate" the film—allowing for a host of new PCO-purifier designs. Furthermore, this "through-film, back-activation" unleashes the potential for many other applications like preserving the shelf-life of organics (e.g., fruits, vegetables, flowers).

Biovation Acquisition COMPANY

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BENEFITS

- **New purification platform:** **OptiClean** enables "through-film, back-activation" technology never before accessible for air/water-purification and organic-preservation product designers.
- **Green technology:** **OptiClean** uses biopolymers like polylactic acid which are 100% environmentally friendly and sustainable, unlike petrochemical-based plastics.
- **Firesafe properties:** **OptiClean's** PLA core is far less flammable and does not generate toxic fumes compared to most petrochemical-based plastics.

OPTICLEAN IN ACTION

Natureworks (a leading PLA producer) has proven the UV transparency of **OptiClean**. Biovation has prototyped and proven the "back activation" aspects of **OptiClean**, with the core PLA material having been manufactured by multiple ISO 9001 suppliers at scale.

IP PROTECTION STATUS

OptiClean and related technologies are protected by patents, pending applications, and trade secrets.

HOW IT WORKS

OptiClean combines the cleaning properties of UV-activated nanophotocatalysts like titanium dioxide, the UV transparency of biopolymers like PLA, and "back-activation" design to create a novel platform for new cleaning devices for a host of applications.

CLEANING PROPERTIES OF TiO_2

Nanophotocatalysts like TiO_2 are well known for absorbing UV light to produce electron-hole pairs that split airborne water molecules to create hydroxyl radicals and super-oxide anions. Such highly reactive radicals and anions can aggressively break down nearly any airborne contaminant (e.g., bacteria, viruses, VOCs, smoke, and odors) into harmless water molecules and carbon dioxide to drastically improve air quality.

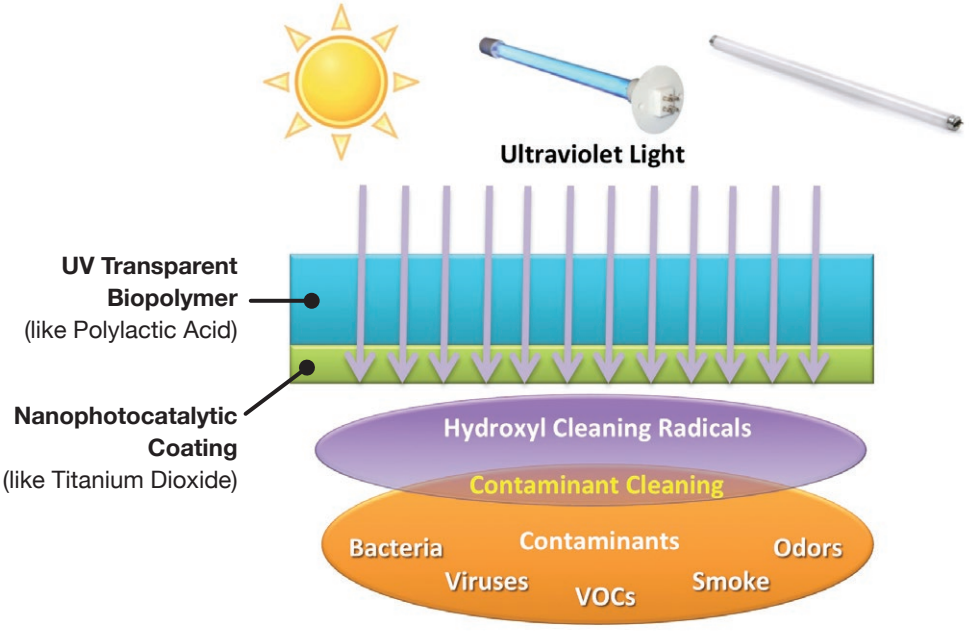
UV TRANSPARENCY OF PLA

UV light is typically absorbed by petrochemical-based plastics such as acrylic, polystyrene, polyethylene, and polypropylene. Expensive materials such as quartz and even sapphire are typically used in applications where UV transparency is desired. Some fluoropolymers have proven UV transparency but exhibit emission-based health concerns. Unlike the aforementioned polymers, Polylactic acid (PLA) is both a bioplastic (derived from plant products) and is virtually UV transparent.

BACK-ACTIVATION DESIGN

In an **OptiClean** device, UV light passes through a PLA-based film to activate a thin layer of TiO_2 from the backside. This activation unleashes the cleaning power of UV-activated TiO_2 that is currently limited to front activation in other designs.

OptiClean's novel design can be used in a host of applications where the UV source could be the Sun, an ultraviolet lamp, or even UV leakage from a close-range fluorescent bulb—making device designs and application ideas nearly endless.



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