Technical Brief

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UV shielding bio-derived furanic polymers (BFPs)

Technology Summary

UV shielding composite films of synthetic and natural polymers with bio-derived furanic polymers via catalytic dehydrataion of biomass sacchrides.

Background

Severe and prolonged UV radiation can cause damage to paints, plastics, wood, rubber etc. Inorganic oxides such as zinc oxide and titanium oxides are often used as UV absorbers in various coatings and formulations, and composites. However, the introduction of such inorganic nanoparticles, even at low concentration, causes a loss in optical clarity, severely limiting the use of such inorganic polymer composites.Recent attention has focused on the use of bio-based materials such as lignin as UV shielders, but the drawbacks include not blocking the entire UV region (200-400 nm) and composite preparation involving the use of hazardous solvents. Moreover, not much is known about the properties of such composites.

Technology Description

Dr. Srinivasan and team have developed a patent-protected process to prepare biomass-derived furanic polymers (BFPs) from various polysaccharides. These BFPs were then used to make UV shielding composite films using conventional solvent evaporation casting. BFP was prepared by catalytic dehydration of biomass sacchride, followed by its removal from the reaction mixture by precipitation with water. The obtained BFP was dried and then used to make composite films with either synthetic / natural polymers. The composite films were then studied for various properties such as UV shielding efficiency, thermal & mechanical stability, etc

Market Potential

The paints & coatings market size is projected to grow from USD 147.2 billion in 2020 to USD 179.4 billion by 2025, at a CAGR of 4.0 %. The plastic additives market size is estimated to grow from USD 45.6 billion in 2021 to USD 59.9 billion by 2026, at a CAGR of 5.6%. Growth of the plastic additives market is primarily triggered by rising demand from the packaging sector.

https://www.marketsandmarkets.com/Market-Reports/paint-coating-market-156661838.html
https://www.marketsandmarkets.com/Market-Reports/plastic-additives-market-722.html

Value Proposition

- The developed BFPs have better UV-shielding efficiency than many FDA approved organic molecules and metal oxides.
- The dark color of BFP can be removed in one step, and the decolorized BFP still exhbits excellent UV shielding with good SPF 15.
- Composite films made using these BFPs and natural and synthetic polymers show improved mechanical strength, even at low BFP loading.
- Multiple raw materials can be used with various catalysts to derive BFP with the current method. These include mostly sugars, agarose, chitosan, seaweed cellulose, potassium alginate etc.
- Removal of BFP from the reaction mixture gives high purity 5-Hydroxymethyl Furfural, which has enormous potential as a bio-based fuel / platform chemical.

Applications

The humin-like furanic polymers can be used as both UV light shielding agent and as well as for improving mechanical strength in various products such as thin films, bottles, tablet strips for pharmaceutical uses, windows, display screens guard, sun protective glass, welding glass, vertical blind, cloths, paints, varnish, dispersant, sun-screen lotions and creams.

Technology Status

- Demonstrated at bench scale (125g of BFP from 1 kg of sugar).
- Patent protected.
- Seeking industry partners interested in technology licensing