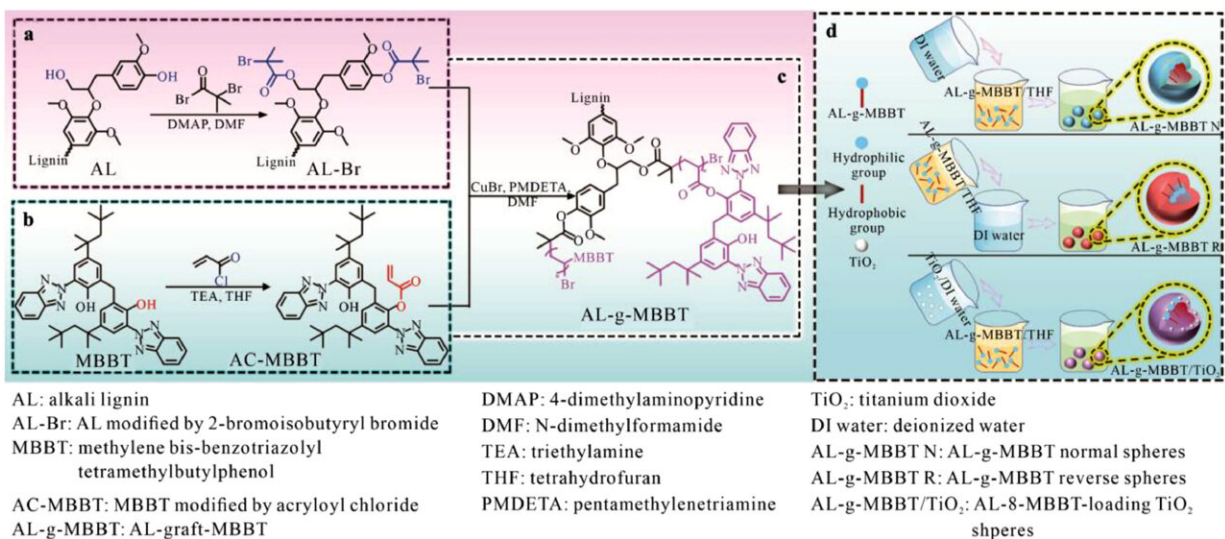


Lignin-based sunscreen offers natural and high-performance UV protection

September 26 2024



Researchers develop a novel lignin sub-microsphere loaded with TiO₂ for enhanced sunscreen capabilities. Credit: College of Light Industry and Food Engineering

In a significant breakthrough for the cosmetics industry, researchers have developed a new type of sunscreen using lignin, a naturally abundant polymer, and titanium dioxide (TiO₂). The study, led by Yarong Li and Zhiguang Tang, was [published](#) in the *Journal of Bioresources and Bioproducts* and details the innovative use of a dual-modified lignin sub-microsphere to enhance the SPF and improve the color of sunscreens.

Lignin, a byproduct of the pulp industry, is known for its UV-absorbing properties and antioxidant capabilities. However, its application in commercial sunscreens has been limited due to its low SPF and dark coloration.

To address these challenges, the researchers conducted a dual modification of lignin's chemical structure and physical form. They grafted methylene bis-benzotriazolyl tetramethylbutylphenol (MBBT) onto alkali lignin (AL) to create a polymer, AL-g-MBBT. This polymer was then transformed into sub-micron spheres with and without TiO_2 loading.

The results were impressive. Sunscreens prepared with 10% AL-g-MBBT₃ demonstrated an SPF of 42.93, a significant increase from the 4.74 SPF of unmodified AL. Moreover, the [color](#) of the modified lignin-based sunscreen was considerably lighter, with a color difference value (ΔE) of 45.6, compared to the 49.5 ΔE of unmodified AL, making it more appealing for cosmetic use.

The researchers further improved the sunscreen's performance by creating TiO_2 -loaded sub-micron spheres. These AL-g-MBBT₃/ TiO_2 @C sunscreens achieved SPFs of 66.20, outperforming both the unmodified AL and the sub-micron spheres without TiO_2 loading. The color of these sunscreens was also significantly improved, with a ΔE value of 36.3.

The study also evaluated the photostability and biocompatibility of the lignin-based sunscreen. The results showed that the sunscreen maintained its sun protection performance and color even after three hours of UV irradiation. Additionally, the biocompatibility tests indicated that the modified lignin-containing sunscreen was non-toxic to human keratinocytes, suggesting it is safe for use on the skin.

This research presents a significant advancement in the application of

[lignin](#), offering a sustainable and high-performing alternative to traditional sunscreen ingredients. The findings could pave the way for a new generation of eco-friendly and effective [sunscreen](#) products.

More information: Yarong Li et al, Development of Methylene Bis-Benzotriazolyl Tetramethylbutylphenol-Grafted Lignin Sub-Microspheres Loaded with TiO₂ for Sunscreen Applications, *Journal of Bioresources and Bioproducts* (2024). [DOI: 10.1016/j.jobab.2024.09.003](https://doi.org/10.1016/j.jobab.2024.09.003)

Provided by Journal of Bioresources and Bioproducts

Citation: Lignin-based sunscreen offers natural and high-performance UV protection (2024, September 26) retrieved 27 September 2024 from <https://phys.org/news/2024-09-lignin-based-sunscreen-natural-high.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.
--