



# Sunscreen from cashew nut shells?

A team of international scientists has found an environmentally friendly way of producing potential sunscreens by using cashew nut shells, a waste material.

So-called 'green chemists' from the University of the Witwatersrand, along with colleagues from universities in Germany, Malawi and Tanzania, are working on techniques to produce useful compounds from wood and other fast growing non-edible plant waste, through a chemical process called xylochemistry (wood chemistry).

Using cashew nut shells, the team has produced new aromatic compounds that show good ultraviolet (UV) absorbance. These compounds could potentially be applied to protect humans and livestock, as well as paints, polymers and coatings, from the sun's harmful rays. The research was published as the cover article of the *European Journal of Organic Chemistry* in August 2019.

UV rays are damaging to most materials, leading to the discoloration of dyes and pigments, weathering, yellowing of plastics, and loss of gloss and mechanical properties. In humans and animals, solar UV radiation can cause sunburn, premature ageing and even the development of potentially lethal melanomas.

To mitigate UV damage, both organic and inorganic compounds are used as UV filters. Ideal organic UV filters display a high absorption of UVA (in the wavelength range 315–400 nm) and UVB (280–315 nm). One important family of UV absorber molecules are derived from aromatic compounds known as phenols, which contain a hydrogen-bonded hydroxyl group that plays an important role in the dissipation of the absorbed energy.

For example, the organic compound 2-hydroxy-4-methoxybenzophenone, also known as oxybenzone or Benzophenone-3, is a common ingredient in human sunscreens, and has also been added to plastics to limit UV degradation. However, it has been shown to cause damage to marine corals in laboratory experiments, and has been detected in freshwater fish from rivers around the world. As a result, there is growing attention from



regulatory bodies and stricter regulations are being enforced on the production of sun-filtering products.

"With the current concerns over the use of fossil resources for chemical synthesis of functional molecules and the effect of current UV absorbers in sunscreens on the ecosystem, we aimed to find a way to produce new UV absorbers from cashew nut shell liquid (CNSL) as a non-edible, bio-renewable carbon resource," says Professor Charles de Koning, of the Wits School of Chemistry. "Cashew nut shells are a waste product in the cashew-farming community, especially in Tanzania, so finding a useful, sustainable way to use these waste products can lead to completely new, environmentally friendly ways of doing things."

The team has filed a patent application in order to commercialise the process in South Africa. Further research is needed to investigate the human health aspects of the cashew-derived compounds before they are used in sunscreens.

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