A greener source of polyester—cork trees

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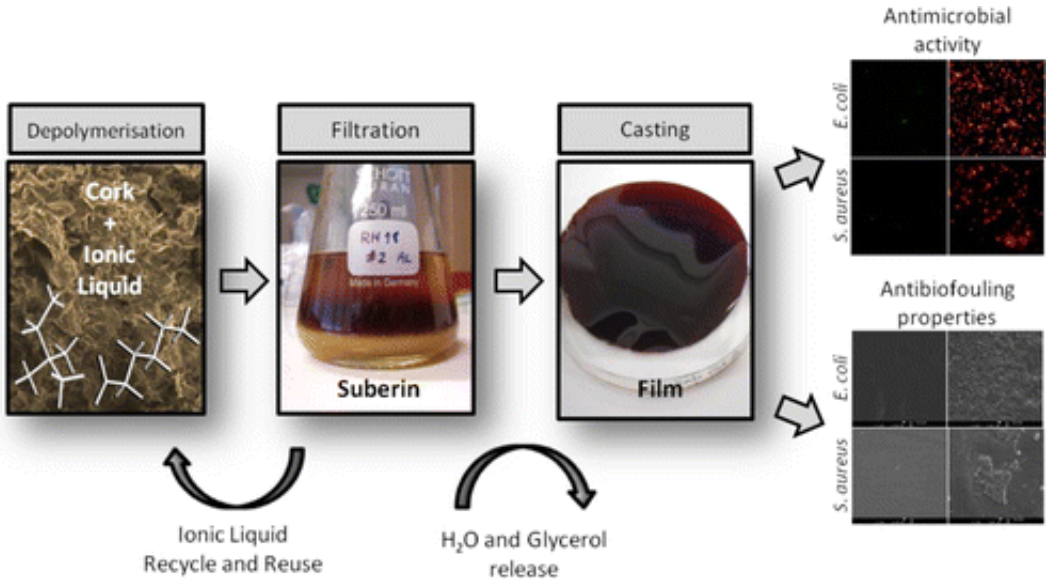

On the scale of earth-friendly materials, you'd be hard pressed to find two that are farther apart than polyester (not at all) and cork (very). In an unexpected twist, however, scientists are figuring out how to extract a natural, waterproof, antibacterial version of the first material from the latter. Their new technique, which could have applications in medical devices, appears in the ACS journal *Biomacromolecules*.

Cristina Silva Pereira and colleagues explain that polyesters are ubiquitous in modern life, and not just as a practical fabric for clothing. Their durability and other traits make them ideal for use in cushioning

and insulating materials, in liquid crystal displays, holograms, filters, and as a high-gloss finish on guitars and pianos. But making polyester for these products involves a toxic process that starts with the melting of petroleum-based products. To replace these synthetic fibers, scientists have turned to nature. More specifically, to the cork oak tree, which makes its own version of polyester—suberin. Attempts to extract suberin intact from the tree's bark have so far resulted in pasty blobs, so Silva Pereira's team decided to find a different way.

They used a new technique to take suberin out of cork and then re-make it in a more useful film form. Although some of the original structure was lost, the resulting plastic-like material was intact enough to keep its waterproof and antibacterial properties. An added perk of the material is that it's biocompatible, which led the researchers to conclude: "One of the first applications we believe will be implemented is clinical usage."

More information: "Ex Situ Reconstitution of the Plant Biopolyester Suberin as a Film" *Biomacromolecules*, Article ASAP. DOI: 10.1021/bm500201s

Abstract
Biopolymers often have unique properties of considerable interest as a basis for new materials. It is however not evident how to extract them from plants without destroying their chemical skeleton and inherent properties. Here we report the ex situ reconstitution of the biopolyester suberin as a new waterproof and antimicrobial material. In plant cell walls, suberin, a cross-linked network of aromatic and aliphatic monomers, builds up a hydrophobic protective and antimicrobial barrier. Recently we succeeded in extracting suberin from the plant cell wall using the ionic liquid cholinium hexanoate. During extraction the native three-dimensional structure of suberin was partially preserved. In this study, we demonstrate that this preservation is the key for its ex situ reconstitution. Without any chemical additives or purification, the

suberin composing macromolecules undergo self-association on the casting surface forming a film. Suberin films obtained show barrier properties similar to those of the suberin barrier in plants, including a potentially broad bactericidal effect.

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