Synthetic tape flagged as unsustainable: Research describes a more eco-friendly option

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We all know the bleak and desolate scene from a thousand crime dramas—the abandoned building, the blood-stained gravel, the flagging

tape that creates a stark cordon around the evidence as it flaps in the chill wind under leaden skies.

Plastic flagging tape is used the world over by law enforcement, construction workers, and many others to create a temporary and obvious boundary around an area that is out-of-bounds to Fred Bloggs, John Doe, and indeed Joanna Public. That's a lot of single-use plastic waste being generated at crime scenes and building sites. Now, a team from Portugal writing in the *World Review of Science, Technology and Sustainable Development*, describes a more environmentally benign material, an eco-friendly, biodegradable flagging tape.

Colored, non-sticking flagging tape is used for marking up in various situations, such as the aforementioned crime scene cordons, and also for mapping applications, marking hazardous trees, orientation points for hunters, hikers and runners, geocachers, mountain bikers, and others taking part in outdoor pursuits. Fundamentally, there is an issue of sustainability with any flagging tape use, but more so in public usage where the tape may be left in place rather than retrieved and disposed of after an event, for instance. The researchers point out that commonly flagging tape is manufactured from polyvinyl chloride (PVC), a non-degradable synthetic polymer.

The study involves the integration of bacterial cellulose (BC) into a cellulose-based film. To enhance its longevity, the team coated this film with one of two natural polymers, chitosan and hyaluronic acid. Additionally, natural pigments from carrots and spinach were used to test how the tape might be colored for particular applications. Mechanical testing demonstrated the semi-synthetic tape is sufficiently strong for common applications. Surprisingly, uncoated BC tape was stronger than that coated with hyaluronic acid, but the tape coated with chitosan was weaker, as were tapes incorporating the natural pigments.

Striking a balance between durability and biodegradability is a challenge that must be addressed to reduce environmental impact effectively, the work suggests. However, the team found that complete biodegradation did not occur within their three-month test period. The work does lay the foundations for developing a new formulation with improved mechanical properties, pigment uptake, and biodegradability. It is worth noting that PVC is almost entirely resistant to biodegradation and so the use of natural polymers will hopefully mark the way for a more sustainable approach to flagging tape.

More information: Rachel Cordeiro et al, Eco-friendly flagging tape, *World Review of Science, Technology and Sustainable Development* (2023). DOI: 10.1504/WRSTSD.2023.133886

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