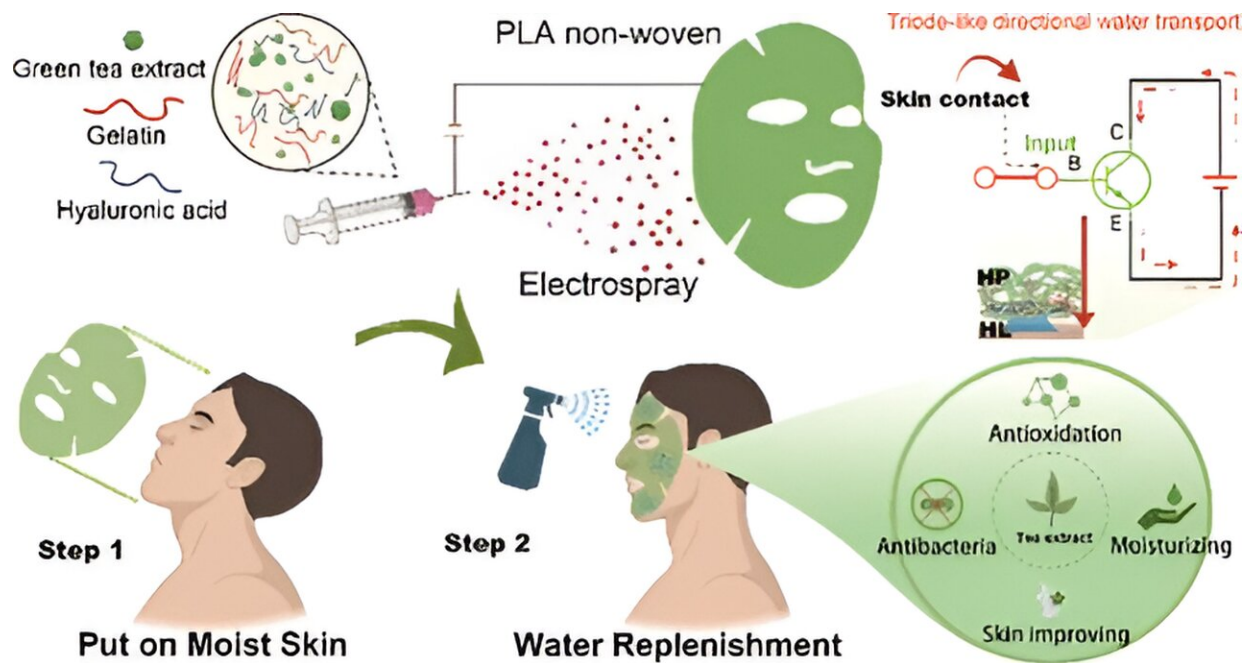


A more eco-friendly facial sheet mask that moisturizes, even though it's packaged dry

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Abstract. The cosmetics industry has a worrying impact on the environment, including the plastics used in products and packaging and environmentally unfriendly additives. In this study, we present an environment-friendly triode-like facial mask (TFM) that utilizes only green and degradable raw materials, nontoxic and harmless solvents, and electric energy to achieve distinct switchable directional water transport properties, avoids a wet storage environment, and reduces excessive packaging. The TFM demonstrates droplet stability when not in contact with the skin while facilitating rapid liquid transfer (15 μL) within durations of 2.8 s (dry skin) and 1.9 s (moist skin) upon contact. We elucidate the underlying mechanism behind this triode-like behavior, emphasizing the synergistic interaction of the wettability gradient, Gibbs pinning, and additional circumferential capillary force. Moreover, the TFM exhibits a reduction in the

proportion of aging cells, decreasing from 44.33 to 13.75%, while simultaneously providing antibacterial and skin-beautifying effects. The TFM brings a novel experience while also holding the potential to reduce environmental pollution in the production, packaging, use, and recycling of cosmetics products. Credit: *ACS Applied Materials & Interfaces* (2023). DOI: 10.1021/acsami.3c15815

Starting a new year, many people pledge to enact self-care routines that improve their appearance. And facial sheet masks soaked in skin care ingredients provide an easy way to do this. However, these wet masks and their waterproof packaging often contain plastics and preservatives. A [study](#) in *ACS Applied Materials & Interfaces* reports a dry-packaged hydrating facial mask made of biobased and sustainable materials.

Consumers in the beauty industry are increasingly concerned about the sustainability and sourcing of personal care items in terms of both products' ingredients and packaging. Facial sheet masks are popular cosmetic products advertised to benefit and enhance the skin. But they are typically made with plastic backing fabrics and are packaged with wet ingredients, requiring preservatives and disposable water-tight pouches.

A more environmentally friendly option would be to package the facial masks dry. So, Jinlain Hu and coworkers aimed to design a facial sheet mask with biobased materials that could be enveloped in paper and later activated to deliver moisture and nutrients.

The researchers developed a facial mask with a sheet of plant-based [polylactic acid](#) (PLA), which could repel water, and they coated it in a layer of gelatin mixed with [hyaluronic acid](#) and green tea extract. They deposited the top layer as either tiny fibers or microspheres, using

electrospinning or electrospray, respectively, and tested how well the masks could transfer moisture. They found:

- Water droplets did not pass through the masks without [skin contact](#), regardless of which side a water droplet was placed on.
- Contact with skin initiated one-way water transport from PLA to gelatin to the skin, but only for masks coated with gelatin-based microspheres.
- Placing the mask on moistened, rather than dry, skin improved water delivery through the mask.

Finally, the team investigated how its mask's ingredients impacted [mouse cells](#) as a proxy for reactions on the skin. Fewer cells showed signals of aging when grown on the mask compared with cells grown in control conditions; the researchers attribute this to the antioxidant properties of the green tea extracts.

The team says the beneficial properties of the natural ingredients and the one-way moisture-delivery design make this mask a promising alternative with a lesser environmental impact than traditional, wet-packed products.

More information: Kaisong Huang et al, Electrospayed Environment-Friendly Dry Triode-Like Facial Masks for Skincare, *ACS Applied Materials & Interfaces* (2023). [DOI: 10.1021/acsami.3c15815](https://doi.org/10.1021/acsami.3c15815)

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