

Self-folding plant-based material that could form 'intelligent' green products



Combining sunflower pollen with printer toner, scientists from NTU Singapore have developed a paper-like material that is able to fold itself into new shapes in response to environmental humidity.

Patterns digitally printed on the pollen paper using a commercial laser printer, determine the three-dimensional shape the paper folds into. The process is reversible but can be “frozen” if a layer of chitosan (a natural sugar found in shellfish) is applied onto the structure.

The NTU Singapore team demonstrated their method, by creating several geometrical configurations, from straws and boxes to more complex forms like a 3D paper orchid.

The printed pollen paper’s ability to fold into 3D configurations demonstrates its potential for use in ‘intelligent’ green products such as self-folding envelopes, boxes, and food containers.

The material also has the potential to be used in ‘origami robots’ – flat sheets that can fold autonomously into 3D shapes – for electronic and biomedical applications with special shape requirements, shape-dependent tissue engineering, and stimuli-triggered drug delivery.

The NTU research team has filed a patent application for potential commercialisation of the technology.

This use of natural renewable resources to develop new-generation eco-friendly materials is in line with the NTU 2025 vision and the NTU Sustainability Manifesto, which aspires to develop sustainable solutions to address some of humanity’s pressing grand challenges.