

Research Highlights

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Subject Category: [Synthesis and processing](#)

Thin films: Boxing clever

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Specially designed thin films can fold themselves up into tiny boxes for storing microelectronic devices

The microelectronics industry has flourished thanks to lithography, however this technique can only operate on two-dimensional wafers. It is far more difficult to produce complex three-dimensional objects, and most attempts to date have required impractically high temperatures. Now David Gracias at the Johns Hopkins University and co-workers¹ have developed a low-temperature technique for making three-dimensional microstructures out of flat templates that 'fold themselves up'.

The templates are produced using conventional two-dimensional deposition methods, and consist of nickel plates joined by hinges made from thin films of chromium, copper and a polymer. When heated to just over 40° C in water, the polymer layer gets softer and the hinge automatically folds to release stress between the metals. By adjusting the film thicknesses, the researchers managed to achieve right-angled folds in a template that folds up into a cube. Several sizes of cubes were made, including some with tiny glass beads trapped inside.

The researchers envisage using their technique to make tiny microelectronic packages, which would be compatible with biological organisms, having sensors on the outside and well-protected circuits inside. By choosing suitable materials, containers could even be made that act as Faraday cages, shielding devices from electrostatic discharges.



REFERENCE

1. Leong, T. G., Benson, B. R., Call, E. K. & Gracias, D. H. Thin film stress driven self-folding of microstructured containers. *Small* doi: 10.1002/smll.200800280 (2008). | [Article](#) |