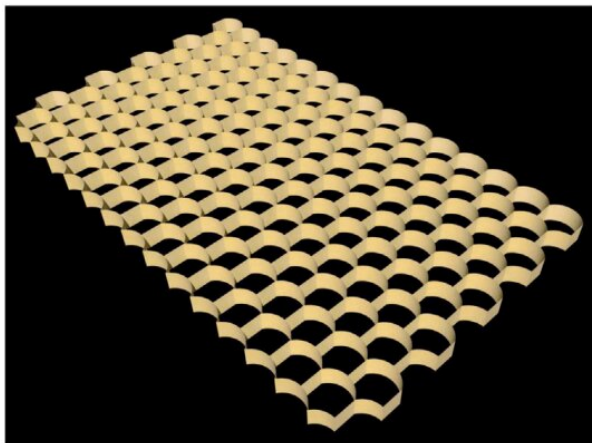


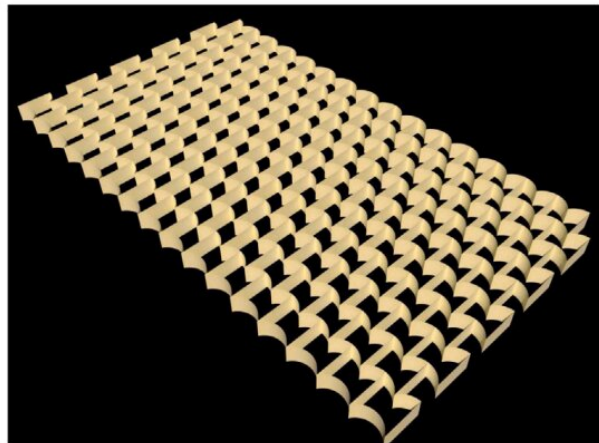
# Study introduces framework to understand new class of curved lattice materials

November 30 2021

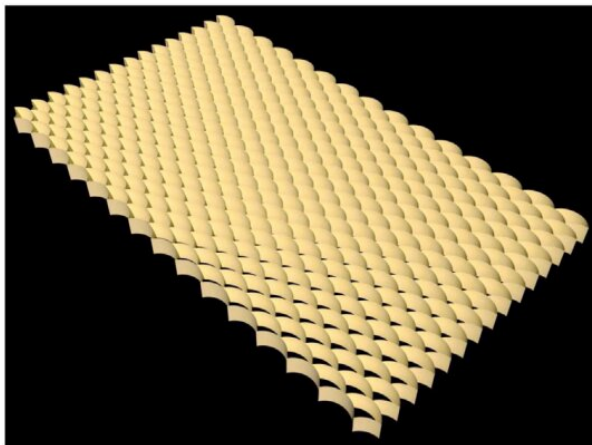
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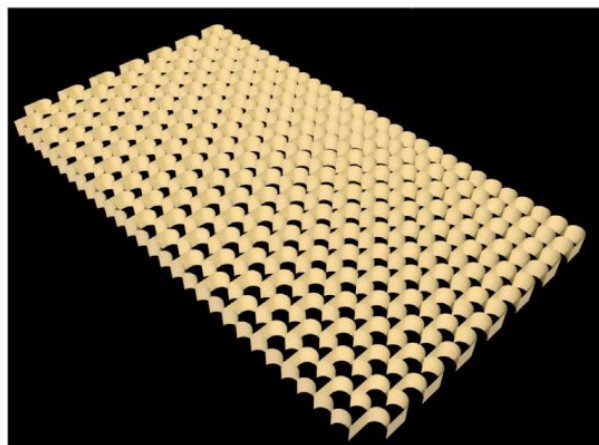
(a) Curved hexagonal lattice



(b) Curved hexagonal auxetic lattice



(c) Curved rhombus lattice



(d) Curved rectangular lattice

Family of curved 2D lattices conceived and analyzed in the study (a) The curved hexagonal lattice, (b) The curved hexagonal auxetic lattice, (c) The curved rhombus lattice, and (d) The curved rectangular lattice. Credit: S. Mukherjee

A new study from Swansea University has introduced a framework to calculate the material properties of a new class of two-dimensional curved hexagonal lattices that could be used in the production of improved mechanical metamaterials found in bio-engineering, stretchable electronics, impact absorption and soft robots.

The [research](#) published in the *Composite Structures* journal, outlines how the research team from the university's Faculty of Science and Engineering pioneered the new framework of calculations, known as generalized closed-form expressions.

Dr. Shuvajit Mukherjee who co-authored the study says that "this paper represents fundamental analytical approaches to obtain the most general closed-form expressions of the equivalent material properties of 2D hexagonal lattices. This work captures a large class of geometry. Introduction of the curved beam as constituent beam members of the unit cell of the [lattice](#) enrich the design space and enhance the flexibility of the structure."

Co-author, Professor Sondipon Adhikari says that "the introduction of a curved [beam](#) element in the unit cell results in increasing the flexibility of the lattice and it also expands the design space for lattice materials. The closed-form expression can be utilized as a benchmark solution for future numerical and experimental investigations. It also can be exploited to obtain user-defined [mechanical properties](#)."

**More information:** S. Mukherjee et al, The in-plane mechanics of a family of curved 2D lattices, *Composite Structures* (2021). [DOI: 10.1016/j.compstruct.2021.114859](https://doi.org/10.1016/j.compstruct.2021.114859)

Provided by Swansea University

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