Negative Poisson's ratio structures made from carbon fiber-reinforced plastics for sustainable applications

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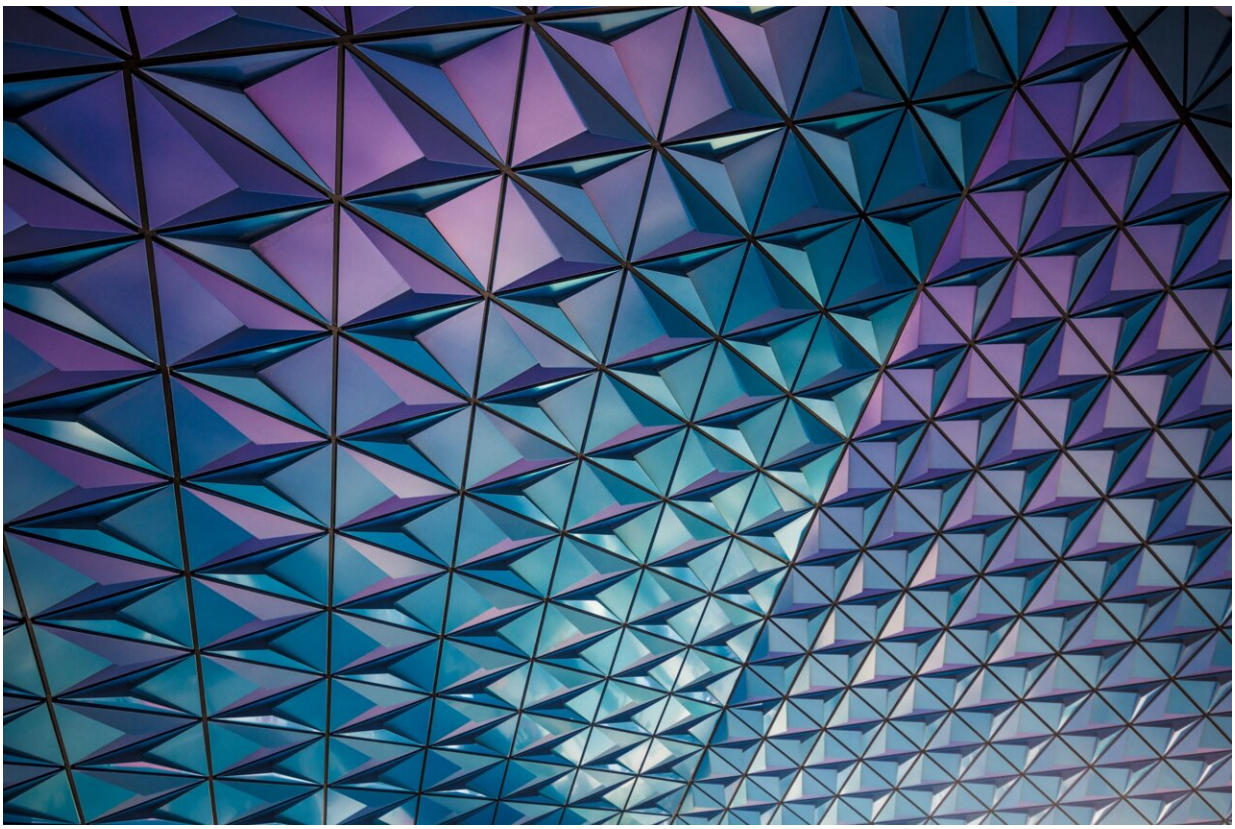

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An international team of researchers revisited the fundamentals of Negative Poisson's ratio structure (NPRS) and investigated its creation

using laminated carbon fiber reinforced plastics, a strong and lightweight material. Their objective was to gain a deeper understanding of the process and explore potential applications, aiming to unlock new possibilities and advancements in the field of materials science for sustainability.

Their study is published in *Materials Today: Proceedings*.

Negative Poisson's ratio structure (NPRS) is a special kind of material that has been extensively studied for its ability to absorb impact energy effectively. It has the potential to be used for protecting lives during collisions, such as in a car accident.

To tackle the challenge of making NPRS lightweight, e.g. for meeting electric vehicle's energy efficiency, the researchers discussed the basic concepts of NPRS and how it can be made using a specific type of strong and lightweight material called laminated carbon fiber reinforced plastics (CFRP). They also used a method called finite element analysis (FEA) to study the mechanical behavior of the CFRP-NPRS. Additionally, they explored the future applications and development of CFRP-NPRS for lightweight cushioning and energy absorption.

The study found that the CFRP-NPRS may experience cracking, delamination, and shear fracture near the corners, and a closed structure may undergo deformation. When the opening structure and closed structure are combined, the closed structure plays a more significant role in the deformation. The NPRS property of CFRP-NPRS is observed through inward contraction of the cross-beam. The stress on the beams shows an alternating distribution pattern, and the layer of fibers called the 0-fiber layer mainly carries the load.

More information: Changfang Zhao et al, Mechanics of carbon fiber reinforced plastics negative Poisson's ratio structures, *Materials Today:*

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