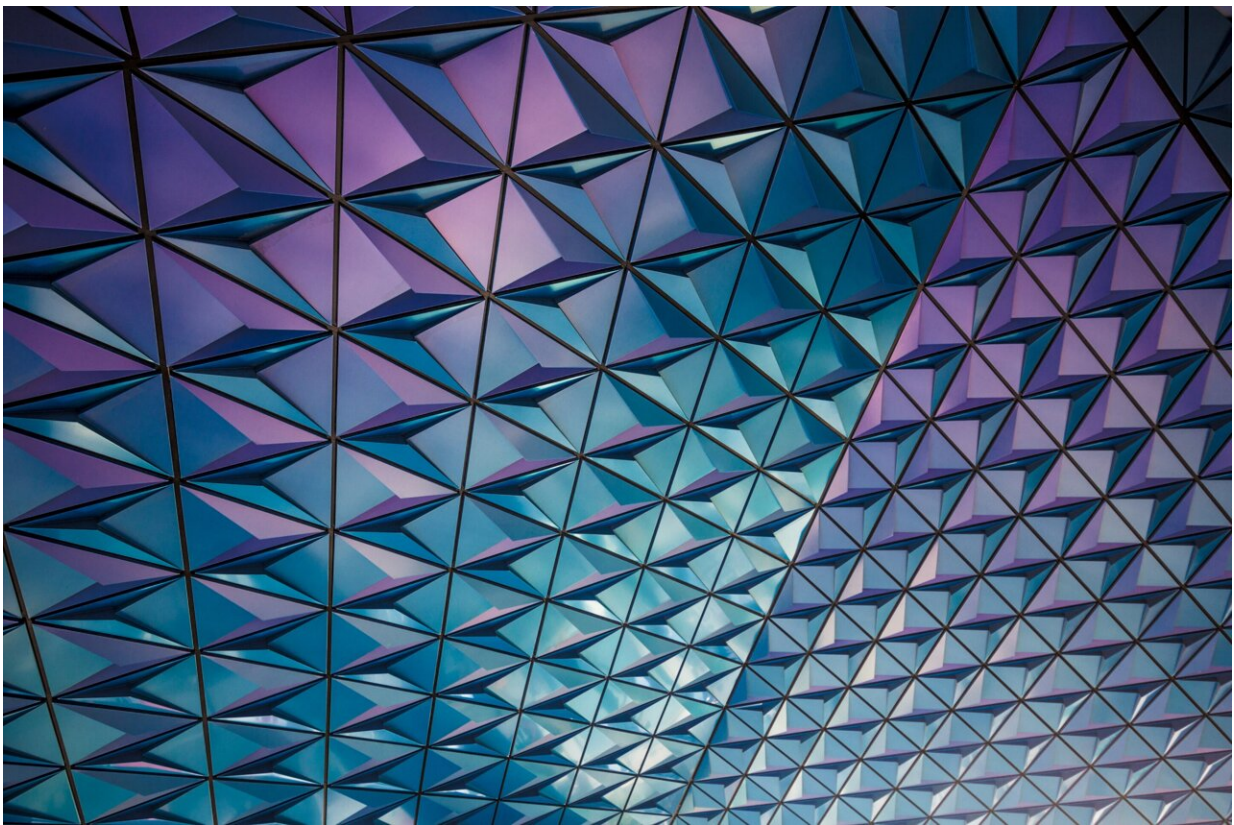


# Negative Poisson's ratio structures made from carbon fiber-reinforced plastics for sustainable applications

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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*:

*Proceedings* (2023). [DOI: 10.1016/j.matpr.2022.12.157](https://doi.org/10.1016/j.matpr.2022.12.157)

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