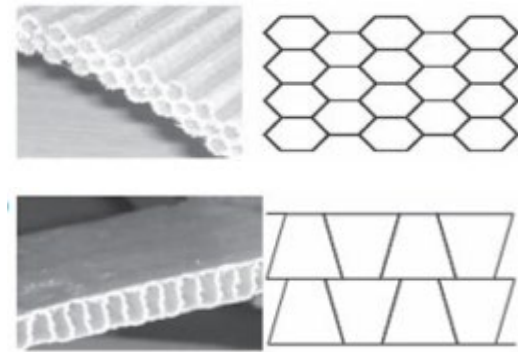Abstrct:

The rise of 3D fabrics is closely related to their properties and is becoming a popular trend for future research and development. In order to give the general public an understanding of 3D fabrics, this article will introduce several structures and properties of 3D fabrics through an extensive literature review, as well as production methods and applications. A tensile test will be carried out to test the elasticity of 3D fabrics.

Unlike 2D fabrics, 3D fabrics are essentially fabrics with a combination of three orthogonal yarns, whereas 2D fabrics consist of a combination of two orthogonal yarns. 3D woven structures can be classified according to geometric criteria into: 3D solid, 3D hollow, 3D dome and 3D knot. [1]3D solid structure can be classified into: multilayer, orthogonal, angle-interlocking.
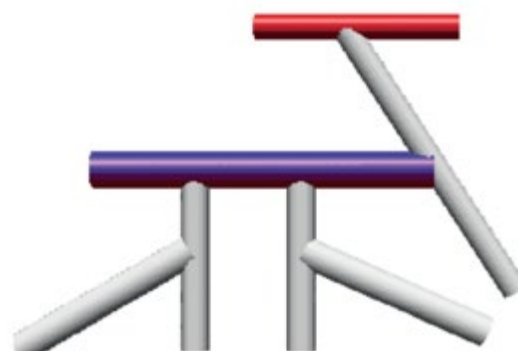

3D hollow structure can be classified into: Uneven and Flat.

3D shell structure can be divided into: by weave combination, by differential take-up and by moulding.

3D nodal structure can be divided into tubular nodes and solid nodes.

Fabrics can be woven in 3D woven, 3D knitting, 3D non-woven, 3D Jacquard design. Due to their dimensional stability, conformability, moulding ability and withstand multi-directional mechanical stress, 3D fabrics can be used in automotive engineering, aeronautics, construction, medical material, transport application, protective clothing, ballistic and various industrial uses.[2]

In medicine, for example, 3D fabrics can be used to make protective clothing, which played a crucial role in protecting the human body during the COVID-19 outbreak.

3D fabrics can also be used in bulletproof vests or helmets, which make the equipment both lighter and easier to carry compared to metal, and also serve to protect soldiers.

Summary:

3D fabrics are being widely researched and used as a lightweight, metal-like fabric that is more suitable for specific applications. However, some of the garments made from 3D fabrics are still uncomfortable or of insufficient quality and are still being improved.

References:
1.Khokar Nandan, 3D weaving and noobing: Characterization of interlaced and non-interlaced 3D fabric forming principles, PH.D. thesis, Chalmers University of Technology, 1987.
2.Shukla, A., 2015. 3D Fabric & Its Application in Clothing. [online] Slideshare.net.