Bioinspired Hierarchical Materials with enhanced mechanical properties

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Biomimicry, drawing inspiration from principles and examples found in nature, provides a means to manufacture materials with exceptional mechanical properties [1]. The adaptability and intricacy inherent in nature's designs enable the generation of hierarchical and multifunctional features across various length scales and a range of designs. This work is focused on the fabrication of bioinspired structures via two-photon polymerization (2PP), showing potential advanced mechanical properties. 2PP is a laser-based 3D printing technique that enables the precise and controlled fabrication of complex three-dimensional structures at the micro and nanoscale [2]. A notable example of a natural hierarchical structure is nacre, having advanced mechanical properties, featuring layers of microscopic aragonite platelets interwoven with a protein matrix ('brick-and-mortar' composite) [3]. This intricate arrangement endows nacre with remarkable strength and resilience, inspiring the development of composite materials for improved impact resistance and structural integrity.

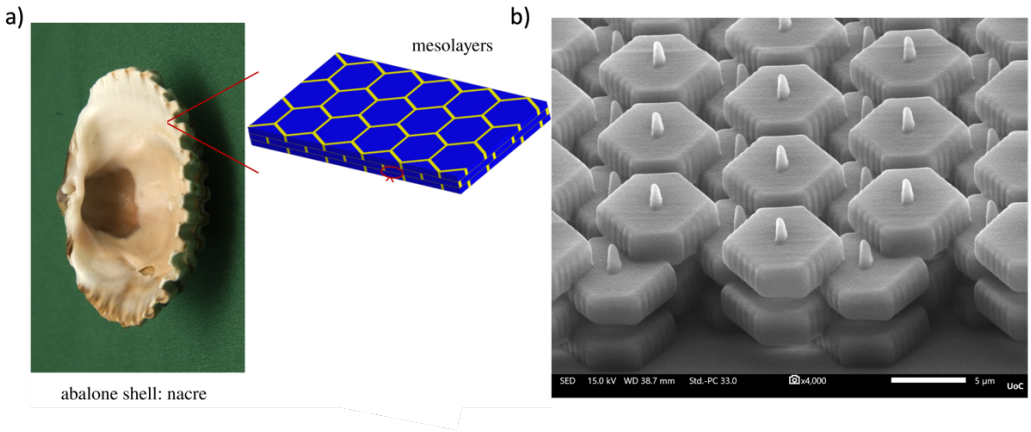

Figure (1): a) Natural structure of nacre b) 3D structure based on the geometry of nacre

References: [1] Klein, L. ;[2] M. Farsari and B. N. Chichkov; [3] Raj, M.; Patil, S.P.; Markert, B.