

Nature's nanocomposite materials – structural design principles and mechanical performance

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A large variety of natural materials with outstanding mechanical properties have appeared in the course of evolution. This includes wood, grasses, bone, sea shells or glass sponges. Biological materials are generally composites of different types of polymers and – sometimes – mineral. They are built in a hierarchical fashion, which allows them to be optimized for their function(s) at many different structural levels. The structure of diverse biological materials such as bone, plant cells walls or mussel byssus fibers will be discussed as examples for strong materials, with adaptive, self-healing and actuation properties.