The exoskeleton (shell) of arthropods typically consists of a biological chitin-based nano-composite associated with inorganic fraction. Chitin is a linear polysaccharide that is the second most abundant polysaccharide in the world after cellulose. It has basically the same structure as cellulose; the chains in both polymers are beta-1,4 linked, but the difference is that chitin has an acetyl-amide group NH-CH2CO instead of the hydroxy group (alcohol) in cellulose. Chitin occurs in the form of fibres in the shells of arthropods like crustaceans and insects (c-chitin), and also in the lego' polo of the squids (b-chitin).

In arthropod exoskeletons, c-chitin fibrils of about 3 nm diameter are surrounded by a protein helix of about 2 nm thickness. These chitin-protein composite structures form a crystalline lattice structure in the main structural element of the arthropod exoskeleton (see fig.1).

Depending on the type of arthropods the exoskeleton contains different fractions of biominal precipitates such as calcite (CaCO3) and magnesium calcite (Mg0.1Ca0.9CO3). The crystalline particles control the hardness of the material. Chitin-based nano-composites with precipitate biominals provide both structural and biomechanical strength at a very small weight and functional flexibility such as required for living species.

Chitin is available in huge amounts as a natural resource from arthropods such as shrimps and related crustaceans. It has a high biodegradability and biocompatibility, so that it is gradually gaining importance as a natural polymer which might face substantial future applications as an alternative to some synthesized polymers.

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