Synthesized Limpet Snail Teeth: A Novel Inexpensive Nanocomposite for Stronger Bio-Compatible Prosthetics

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Expensive titanium alloys are currently used for prosthetics. The main problem with titanium alloys as biomaterials is that titanium has poor tensile strength and wear resistance. The teeth of limpet snails, consisting of goethite nanofiber within a softer chitin phase, have been proven to be the strongest natural occurring material. A bio-inspired organic nanocomposite was modeled after these teeth in an attempt to create a material for a biocompatible, high-strength, and inexpensive prosthetic. A chitin film was first developed using a pre-existing method called the freeze thaw method and was alternately soaked in goethite and chitin using a crane made from an in-expensive robotics kit. The number of cycles was changed after each trial, starting at 0 cycles and incrementally increasing by 10 cycles. The nanocomposites were then tested for tensile strength and elastic modulus and observed under a SEM for visual analysis. The current nanocomposite under 60 and 80 soakings has a mean tensile strength of 1018.9 and 1198.5 MPa which is stronger than any titanium alloy currently used for prosthetics. Research is still ongoing and data is forthcoming for better statistical analysis.

Awards Won:
Third Award of $1,000