

The 2014 Research Symposium Series

*** Free Pizza ***

Monday, March 31, 2014

4:30 pm in ARMS 1021

An Investigation Into Temperature Dependent Nanomechanical Properties of Crustacean Exoskeleton of Shallow Water Shrimps

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Temperature dependence of the mechanical properties of shrimp crustacean exoskeleton is investigated with focus on understanding the influence of microstructure on the reduced modulus, hardness and creep mechanisms. Nanoindentation experiments were carried out at temperatures ranging from 30°C to 80°C to measure the change in the properties with temperature. Scanning Electron Microscopy (SEM) was performed on the surface and fractured cross section to understand the structural hierarchy at the nanometer scale. The mechanical properties and structure of the shrimp exoskeleton was compared with other crustacean species, for example crabs and lobsters. The difference in the properties is correlated with the structural differences in the chemical composition, thickness of the layers and packing density. The reduced modulus values are found to be around 28 GPa at 30°C that reduces to about 24 GPa at 80°C. The hardness values also show the same decreasing trend and decrease from 1.6 GPa at 30°C to around 1.2 GPa at 80°C. The decrease in properties is related to the change in the properties the nano scale structural arrangements, chemical composition of the exoskeleton mainly the proteins and the calcium based minerals.