

TOUGHENING MECHANISMS IN MINERALIZED BIOLOGICAL MATERIALS

*Po-Yu Chen¹
Joanna McKittrick¹
Marc A. Meyers¹*

Abstract

Mineralized biological composites have exceptional mechanical properties that are far beyond the weak constituents from which they are assembled. The hierarchical structure of these materials is at the crux of this enhancement. Microstructural features such as laminated organic/inorganic interface, twisted plywood structure and the presence of organized porous and fibrous elements are common in these composites. We review our recent studies on a variety of mineralized biological materials, including abalone nacre, crab exoskeletons, fish scales, elk antler, and armadillo armor, using the Materials Science approach. The structure-property relationship, design strategy and toughening mechanisms in mineralized bio-composites will be present and compared. Learning from nature offers insight into the development of novel bio-inspired synthetic materials. Research supported by the National Science Foundation Biomaterials Program (DMR 0510138) and Army Research Office (W911-08-1-0461).

¹ *University of California, San Diego.*