

Abstract Submitted  
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**Organic-inorganic Interface in Nacre: Learning Lessons from Nature**<sup>1</sup> NIMA RAHBAR, SINA ASKARINEJAD, Worcester Polytechnic Institute — Problem-solving strategies of naturally growing composites such as nacre give us a fantastic vision to design and fabricate tough, stiff while strong composites. To provide the outstanding mechanical functions, nature has evolved complex and effective functionally graded interfaces. Particularly in nacre, organic-inorganic interface in which the proteins behave stiffer and stronger in proximity of calcium carbonate minerals provide an impressive role in structural integrity and mechanical deformation of the natural composite. The well-known shear-lag theory was employed on a simplified two-dimensional unit-cell of the multilayered composite considering the interface properties. The closed-form solutions for the displacements in the elastic components as a function of constituent properties can be used to calculate the effective mechanical properties of composite such as elastic modulus, strength and work-to-failure. The results solve the important mysteries about nacre and emphasize on the role of organic-inorganic interface properties and mineral bridges. Our results show that the properties of proteins in proximity of mineral bridges are also significant. More studies need to be performed on the strategies to enhance the interface properties in manmade composites.

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