Observation and Research of the Lambdoidal Layup in Bivalva Shell

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ABSTRACT

Molluscan shells behave excellent strength, stiffness and fracture toughness. These favorable mechanical properties are closely related to the exquisite microstructures in the shells that were optimized by nature through many centuries. In this paper, the SEM observation on a bivalva shell is reported, which shows that the shell is composed of aragonite layers and organic matrix. Each aragonite layer consists of many lathy aragonite sheets. The observation also shows that there is a kind of lambdoidal layup in which the orientation of the aragonite sheets in the different layers is almost unchanged. The maximum pullout force of the lambdoidal layup is analyzed based with its representative model. The analytical result shows that the lambdoidal layup can markedly increase the pullout force and increase the fracture toughness of the shell.

Keywords: Bivalva shell, natural ceramic composite, aragonite sheet, lambdoidal layup and maximal pullout force

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