中文摘要

貝類成長時不須換殼，文蛤殼開口處之顏色可用來判斷其健康程度。這些很平凡的現象其實背後隱藏著不平凡的鈣化機制。海洋裡有爲數眾多的生物，包括貝類、珊瑚、浮游生物和藻類等，都有鈣化能力。但因人類大量使用化石燃料使海洋酸化，這些生物的鈣化能力受到威脅。 從化石記錄知道地球曾發生數度的物種滅絕，其中至少有三次海洋鈣化生物承受最大損失，原因是海水缺氧或海洋酸化。

貝類的殼含兩種碳酸鈣結晶，一是亞穩態的霰石結晶，另一是穩定的方解石結晶。我們要研究的文蛤及大部分的軟體動物會先製造霰石，再將霰石轉成方解石結晶。我們發現霰石-方解石的轉換對文蛤的生長是個關鍵。影響轉換除了化學因素外，機械力學也很有關係，因爲碳酸鈣的穩定度與壓力有關。貝類的碳酸鈣結晶只產生在開口處，殼會隨身體成長，有個有趣的力學機制在控制晶相的轉換。研究鈣化機制的細節，在人類面臨海洋酸化的時代是很有意義的。

英文摘要

Shellfish do not need to moult their shell as they grow. The color of shell at the aperture is an indicator of the fitness of clams. These two facts about shellfish may sound commonplace, but the calcifying mechanism behind them is rather interesting. Calcification is widespread among marine organisms, including corals, mollusks, plankton and algae. In present time, these organisms are threatened by increasing ocean acidification due to fossil fuel burning. According to fossil record, the earth has experienced a number of mass extinction events. At least three of the events mark severe loss of calcifying organisms due to ocean acidification.

Calcium carbonate mostly occurs in two forms: metastable aragonite and stable calcite. Clams as well as many other species of mollusk produce aragonite first and then transform the crystal to calcite. The aragonite-calcite transformation is critical to physiology of clams. Besides chemical factors, mechanical effect also plays a certain role in controlling calcification since the stability of calcium carbonate crystal is dependent on pressure. Studying the details about calcification is an important and meaningful task.