

# Researchers discover biomechanism behind formation of mother-of-pearl

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Nacre, also known as mother-of-pearl, is a biomineral that forms inside of molluscan shells and also makes up the outer coating of pearls. It is formed through a blend of minerals that are secreted by oysters and other mollusks and deposited inside their shells. The iridescent optical property of nacre has contributed to it being long sought after for decorative purposes, but its fracture-resistant feature also makes it a strong candidate for the creation of biomimetic materials that can be used for, among other purposes, synthetic bone and teeth. Scientists have long studied nacre due to this fascinating combination of characteristics and potential, but the mechanisms behind its formation have remained elusive.

However, research conducted by Professor Hyung Joon Cha and Dr. So Yeong Bahn from the Department of Chemical Engineering at Pohang University of Science and Technology (POSTECH), in collaboration with Professor Yoo Seong Choi at Chungnam National University, has shed light on the key mechanism behind the formation of [nacre](#). The team has discovered the role of the matrix protein Pif80 from the pearl oyster *Pinctada fucata* and its involvement in the development of the nacre. This achievement has been published in the world-renowned *Science Advances*.

Nacre is composed of platelets of aragonite (a form of calcium carbonate) separated by sheets of elastic [biopolymers](#). This mixture of brittle platelets and elastic biopolymers—a brickwork arrangement of sorts—gives nacre its resilient properties. However, this

biomineralization process is not performed directly on the calcification site due to the highly unstable nature of amorphous calcium carbonate precursor, which suggests that the initial phase is formed elsewhere and transported to the site in a stable form. Studies have suggested that Pif80 may play a crucial role in this biomineralization process.

The team synthesized recombinant Pif80 to investigate its role in nacre formation. They discovered that Pif80 participates in the formation and stabilization of amorphous calcium carbonate precursor by forming coacervates. The team also discovered that once at the calcification site, the Pif80 contributes the formation of polygonal aragonite platelet structure of nacre.

Cha and Bahn emphasized the importance of discovering the mechanism behind nacre formation and looks forward to this achievement leading to novel applications and advancements for the creation of nacre-based synthetic biomaterials such as bones and teeth.

Provided by Pohang University of Science & Technology

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