According to Penn State researchers, the answer to prolonging the life of microbial fuel cells under the sea may be discarded lobster and crab shells.

Microbial fuel cells produce energy when the microbes consume organic matter. However, such fuel cells are at the bottom of the ocean, where very little, if any organic material is found. This lack of organic matter drastically limits the lifetime of any microbial fuel cell on the ocean floor.

Bacteria pass electrons to an anode to power microbial fuel cells. An electric current is produced as the electrons flow through a wire from the anode to a cathode. During this process, the bacteria consume whatever organic matter is in the surrounding water or sediment. Researchers at Penn State use bacteria that occur naturally in the oceans and chitinous shells because they are also naturally occurring.

Because a solution is needed to increase the lifetime of these fuel cells, researchers include chitin in a pillow-like anode made of carbon cloth. Processed lobster and crab shells are known as chitin. The naturally occurring bacteria eat the chitin that is placed nearby.

Bruce E. Logan, Kappe Professor of Environmental Engineering at Penn State, concludes, "This approach is good for deeper ocean areas [where] we want to increase the power of marine microbial fuel cells."

Marine biologists place power sensors in remote areas of the ocean to measure temperature, pressure, salinity, density, turbidity, and content of the ocean. Additionally these sensors can be placed on buoys or on offshore drilling platforms to monitor pollution and contamination.

Researchers also tested cellulose, which did not test as well as chitin.

The ocean is so used to chitin that there may be more naturally occurring bacteria that eat chitin than those that eat cellulose, Logan concluded.

The researchers tested the microbial fuel cells in a laboratory environment, not in the ocean. In the laboratory, the testing environment consisted of a glass bottle with the anode embedded in the sediment, carbon paper and platinum cathode suspended in water.

Two different sizes of chitin were tested. The finer chitin particles produced almost twice the power as the larger chitin particles. While both sizes of chitin increased power production, it was found that the finer chitin is more productive because it is smaller and easier for the bacteria to consume.