

SHORE PROTECTION, BEACH FORMATION, AND PRODUCTION OF BUILDING MATERIALS AND ENERGY USING SEAWATER ELECTROLYSIS TECHNOLOGY

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Electrolysis of seawater in the Biorock process grows solid limestone (aragonite) structures in the sea. These can be any size or shape, including prefabricated construction elements, coral reefs, oyster banks, and breakwaters. Biorock structures continually grow and get stronger with age, in contrast to all other marine construction materials. They have the unique property of self-repair: damaged areas or cracks are first filled in as the material grows. Materials produced typically have nearly 20% porosity, but more than three times the compressive strength of concrete. If grown under incorrect conditions, weaker magnesium minerals form instead. Biorock structures in the Maldives, by creating a growing coral reef barrier that slows down wave energy at the shoreline, have converted beaches that had nearly eroded away into more than 15 meters of growth in a few years. Biorock materials can produce walls, roofs, and building blocks at a lower cost than imported cement, eliminating mining reefs for limestone blocks and sand. At the same time, the process generates hydrogen that can be tapped as a non-polluting fuel. The Biorock process can use any source of low voltage direct current, but is ideally suited to photovoltaic cells, windmills, and tidal and ocean current turbines. We have developed methods to optimize the efficiency of the process and eliminate potential negative environmental impacts. Conventional breakwaters and sea walls made from concrete or rock typically cost around \$15 million per kilometer. Biorock breakwaters cost orders of magnitude less, while also restoring local ecosystems and fisheries. Tens of thousands of kilometers of shore will need to be protected from global sea level rise in coming decades. Biorock structures are the cheapest and most environmentally-sound technology for their protection.