

NEW PROCEDURE FOR ANOXIC MARINE SEDIMENT REMEDIATION

P PATENTED TECHNOLOGY



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ABSTRACT

The “Ecosystem and Biodiversity Management” (Spanish initials: **GEB**) and “Agricultural Chemistry” (Spanish initials: **QA**) research groups at the **University of Alicante** have developed a new anoxic marine sediment remediation system and procedure that allows *in situ* transformation of soft, black, muddy sediment with a high organic matter content and a characteristic fetid odour into **well-oxygenated, firmer sediment that has a much lower organic matter content and is no longer black or foul smelling**.

The procedure involves injecting oxygen-saturated sea water into the sediment to displace anoxic pore water. A suction pump system **collects sea water**, which is then **stored** and **treated** in a tank by means of a bubbling system to achieve **oxygen saturation** before being **injected** via nozzles into the **sediment to treat**, using an injection sequence of between 90-180 minutes of rest and 50-70 minutes of injection.

This technology, which has been developed at laboratory scale and is protected by patent application, could be used for **remediation of anoxic sediments on shallow beaches** and materials extracted during **port dredging** that require **elimination of anoxic conditions**.

The research groups are seeking **companies or public sector authorities** interested in **commercial exploitation** of the invention.

TECHNOLOGY ADVANTAGES AND INNOVATIVE ASPECTS

The great advantage of this remediation system with respect to other available decontamination techniques is its **lower environmental impact**, since it does not involve the introduction of exogenous substances into the environment. Instead, it simply replaces oxygen-poor water (concentrations <2 mg O₂/L at 20°C) in the sediment with oxygen-saturated sea water (concentrations ≈9 mg O₂/L at 20°C). In under twenty days, good oxygenation conditions are generated that facilitate degradation of the organic and inorganic compounds that accumulate in anoxic/hypoxic conditions and lead to the formation of unhealthy sludge.

Application of this procedure achieves *in situ* transformation of soft, black, muddy, anaerobic sediment with a high organic matter content and a fetid odour into **well-oxygenated, firmer sediment that has a much lower organic matter content and is no longer black or foul smelling**.

This greatly improves the environmental and health-related aspects of anoxic/hypoxic sediments on tourist and recreational beaches. Furthermore, remediation of sediments extracted during port dredging would allow these to be deposited onto beaches without negatively affecting the ecosystem, since the procedure eliminates the organic matter and toxic substances responsible for the black colour and foul odour.

In addition, it enhances the sediment’s capacity to **host infauna** of ecological, fishing or even fishkeeping interest by improving the highly anoxic conditions of the pore water and sediment.

This remediation system could also be used to **immobilise** certain heavy metals and other toxic inorganic compounds that accumulate in anoxic/hypoxic sediment and pore water. As a result, the sediment would no longer act as a **sink for heavy metals** present in the water.

This sediment remediation technique could also be used to prevent the need for **dredging**, which is more expensive and may even be impossible in

certain locations for legal or technical reasons.

Last but not least, it could also be used as **preventive measure to forestall the formation of anoxic sediments** in a variety of environments (e.g. the open sea, reservoir and river beds, seagrass meadows and aquariums).

The technology described here presents the following innovative aspects with respect to other technologies available on the market:

- The **type of contaminant to degrade**: organic matter and inorganic substances generated in anoxic conditions;
 - The **zones where these occur**: shallow beaches and calm waters where anoxic sediments accumulate;
 - The **procedure and equipment** required for remediation of muddy sediments: injecting oxygen-saturated sea water is a completely novel technique.
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MARKET APPLICATIONS

This invention falls within the field of **decontamination technologies for sediments** affected by organic and inorganic substances, and more specifically of actions and techniques aimed at **regenerating sediments, enhancing conditions** for public and recreational use of beaches and **environmental remediation** of anoxic sediments extracted during port dredging.

COLLABORATION SOUGHT

The research groups are seeking companies or public sector authorities interested in acquiring this technology for commercial exploitation through:

- Patent licence agreements;
 - Technical cooperation agreements (R&D projects) for use/adaptation of this technology;
 - Subcontracting/ technical assistance agreements;
 - Others.
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