FEATHERTECH- Sustainable Innovation for the Reclamation of Water Contaminated by Hydrocarbons

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This research addresses the problem of marine pollution from heavy hydrocarbons (C10–C40), highly persistent petroleum-derived substances that compromise aquatic ecosystems and biodiversity, especially in port areas. These contaminants, largely originating from anthropogenic activities, form surface films, accumulate in sediments, and cause toxic, mutagenic, and carcinogenic effects along the food chain. The aim of the study is to identify a sustainable and low-cost method for removing these compounds, proposing the use of chicken feathers, an abundant by-product of the poultry industry, as a natural adsorbent material. The feathers, composed of hydrophobic and resistant keratin, are able to effectively capture hydrocarbons thanks to their protein and lipid structure, also offering an opportunity for the circular valorization of livestock waste. Experimental tests conducted on contaminated seawater (100 mg/L of oil and diesel) showed an average adsorption capacity of 76%, higher than that of PVC or barley straw,without releasing microplastics or unwanted substances. The feathers also maintained good performance after desorption cycles using hexane treatment, with a recovery efficiency exceeding 95%. Based on the results, an eco-friendly skimmer prototype equipped with a chicken feather filter and a photovoltaic pump, coupled with a closed-loop regeneration system using eco-friendly solvents, was designed. This solution combines sustainability, effectiveness, and low environmental impact, establishing itself as an innovative model for the continuous or emergency remediation of marine water contaminated by hydrocarbons.

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