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An experimental study of clay-bacterial interaction in Prestige oil

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Experimental results are presented which highlight the interactions of clays and bacteria for effective breakdown of hydrocarbons in saline conditions. Mixtures of spilled Prestige crude oil, sea-water and a range of clay types (Na- and Ca-montomorillonites, mica-montmorillonite, hectorite, palygorskite and kaolinites of varying crystallinity were left to react for 36 months with little agitation and in the absence of light. Investigation of the reactant products revealed extensive bacterially mediated breakdown of oil occurred in clays with large surface areas and high cation exchange capacities. Particularly successful remediators were the Ca-montmorillonites, which may reflect the ability of Ca2+ ions to attract the negatively charge surfaces of both clay and bacteria. Such sample contained $<$10% of the initial concentration of free Prestige oil. The types and abundance of bacteria present appears to vary depending not just on the concentration and types of hydrocarbons present but also on the type of clay mineral phase used. This study highlights the importance mineral surfaces and sustainable mineral nutrients, which can significantly speed up the bioremediation of hydrocarbon spills in the coastal environment.