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Development of High Efficient and Low Toxic Oil Spill Dispersants based on Sorbitol Derivants Nonionic Surfactants and Glycolipid Biosurfactants

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ABSTRACT

Dispersants, usually blending with several surfactants and a solvent, are used to enhance oil spill dispersion as small droplets in water column. Although there is growing acceptance of dispersants as a counter measure to marine oil spills around the world, the two major issues with the dispersants are their toxicity to marine life and dispersion effectiveness (DE) for crude-oil, especially for heavy oil. To develop more efficient and less toxic dispersants, two kinds of sorbitol derivant nonionic surfactant (polysorbate 85 and sorbeth-40 tetraoleate), two kinds of glycolipid biosurfactants (rhamnolipid and sophorolipid) and less toxic solvent ethylene glycol butyl ether were chosen in this study, and two dispersant formulations were optimized by uniform design methods. Effects of dispersant-to-oil ratio, temperature, salinity and pH on the performance of the two optimized dispersants were investigated. The two dispersants had high dispersion effectiveness (DE) for heavy crude oil, while both dispersants keep high DE at the dispersant-to-oil ratio below 1:25 and the temperature above 5 °C. In addition, the two dispersants also performed well in a wide range of salinity and pH values. Finally, toxicity tests revealed that the two dispersants showed low toxicity to two kinds of fish (*Danio rerio* and *Microgobius gulosus*).

KEYWORDS

Oil spill dispersant; Formula uniform design; Baffled Flask Test; Effectiveness; Toxicity

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