Toxicity Evaluation of Two Surfactants With Anticorrosion

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Surfactant research is a rapidly developing field due to its booming applications in many fundamental industries such as detergents, fabric softeners, emulsions, and most importantly, corrosion inhibition. The pipeline system is crucial for the transportation of oil and gas in the industry, but the pipeline surfaces are consistently exposed to sources of corrosion. The use of conventional commercial corrosion inhibitors to reduce corrosion is limited due to their harmful impact on the environment. Surfactants like Silicon-Q-22 and Poly-Q-47 are effective "green"corrosion inhibitors. To the best of our knowledge, no prior research has been done to assess the impact of either surfactant's safety on the ecosystem on aquatic organisms. Methods: We investigated the potential organ-specific toxicity of Silicon-Q-22 and Poly-Q-47 surfactants using the zebrafish embryo model. This includes (i)mortality/survival rate assay to determine the median lethal concentration (LC50); (ii)teratogenicity assay to determine the no observed effect concentration (NOEC); (iii) organ-specific toxicity assay including cardiotoxicity analysis, neurotoxicity , and cellular stress/apoptotic cells detection (using acridine orange). Results: The calculated LC50 of Silicon-Q-22 and Poly-Q-47 was 22.36 and 8.28 mg/L, respectively. Thus, according to the Acute Toxicity Rating Scale provided by the USFWS, Silicon Q-22 was described as“Slightly toxic” and Poly Q-47 as“Moderately Toxic”. The NOEC of both surfactants exerted several toxic effects on different cardiac parameters. However, only the embryos treated with the NOEC of Poly-Q-47 showed signs of neuromuscular toxicity . Nevertheless, the NOEC of both surfactants did not induce significant cellular stresscompared to the negative control.

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