

Aerobic biodegradation of four representative commercial surfactants under a range of concentrations (i.e., sub- and supra-critical micelle concentrations, CMCs) beyond those ordinarily used in biodegradation studies was investigated. Of the four surfactants tested, sodium dodecylbenzene sulfonate (SDBS) showed no biodegradation and foam degradation. At a sub-CMC (500 mg/l), primary biodegradation, as measured by methylene blue active substances (MBAS) for an anionic surfactant sodium dodecyl sulphate (SDS) and by cobalt thiocyanate active substances (CTAS) for a nonionic surfactant Witconol, followed Monod kinetics, substrate depletion being a function of both microbial growth and substrate concentrations. However, primary biodegradation at supra-CMCs (500 for Tergitol and 2500 mg/l for SDS and Witconol) and ultimate biodegradation (mineralization) at both sub- and supra-CMCs were best described by first-order kinetics, the degradation rate being a sole function of substrate concentrations. Parameters for the kinetic models (K_s , Y , μ_{\max} , and k) were estimated using non-linear least squares methods. Increasing surfactant concentrations from sub- to supra-CMCs significantly decreased primary biodegradation, ultimate biodegradation, and foam degradation. This decrease may be attributed to the limited bioavailability of surfactants in the micellar phase as compared to the monomeric surfactants. The results are of significance for surfactant-based remediation, since the concentrations of surfactants employed in remediation are typically much higher than CMCs, while surfactant concentrations of primary interest in biodegradation work are in the neighborhood of and below 10 mg/l, which is usually 10–100 times lower than CMCs.