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Performance of a continuously stirred tank bioreactor system connected in series for the biodegradation of thiocyanate and free cyanide

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ABSTRACT

A microbial consortium which was largely dominated by *Thiobacillus* sp. and *Serratia* sp. was evaluated for the biodegradation of thiocyanate (SCN^-) and free cyanide (CN^-) under neutral to alkaline conditions, in a two-staged stirred tank bioreactor system operated in series. The bioreactors were operated across a range of residence times (7 d to 24 h), SCN^- (100-1000 mg SCN^-/L) and CN^- (200-450 mg CN^-/L) concentrations at room temperature (21 – 25 °C). The bioreactors were characterised by high SCN^- degradation efficiencies (>99.9%) throughout the experimental run except when the microorganisms were temporarily shocked by a pH increase and the introduction of CN^- within the system. Similarly, high CN^- biodegradation efficiencies (>99.9%) were observed subsequent to its introduction to the system. Planktonic microbial activity tests by organisms within the bioreactor system revealed high SCN^- and CN^- degradation efficiencies (>80%); a direct indication of high planktonic microbial activity within the bioreactor system. Furthermore, there was an observed total nitrogen removal by the organisms within the system, which demonstrated the nitrification and denitrification capacity of the organisms while the sulphate concentration increased as a result of SCN^-

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