

TOXICITY

Toxicity

Toxicity is mainly caused by the presence of excess concentration of heavy metals, alkalis, sulphate, sulphide, chloroform, cyanide, phenols, chlorides, nitrate, oxygen, etc. These toxic compounds should not be present at concentrations inhibitory to the growth and granulation of microorganisms. When waste contains some toxic substances, techniques such as, dilution of the wastewater, recirculation of the effluent, mixture of the waste with other waste, pre-acidification, etc., may be adopted to reduce the toxicity.

A large amount of NH_4^+ (> 1000 mg/L) is toxic to anaerobic bacteria, especially at high pH values [Brunetti *et al.*, 1983]. Other substance worth mentioning is sulphate. By reduction, sulphate gets converted to H_2S . Since, sulphide, particularly undissociated H_2S , may be highly toxic to bacteria. It is necessary that the COD/ SO_4 ratio be higher than 10 [Souza, 1986, Lin and Yang, 1991]. Besides, H_2S may cause odor and corrosion problems.

The saturated long-chain fatty acids caprylic, $\text{C}_{8:0}$; capric, $\text{C}_{10:0}$; lauric, $\text{C}_{12:0}$ and myristic $\text{C}_{14:0}$; (where, in the abbreviation $\text{C}_{x:y}$, x and y indicate carbon chain length and number of double bonds, respectively) proved to be toxic for methanogens in granular sludge in UASB reactor. Their toxicity threshold levels for *Methanothrix sp.* rich culture is 6.75 mM, 2.6 mM, 1.6 mM, and 2.6 mM for caprylic, capric, lauric, and myristic, respectively [Koster and Cramer, 1987].

Phenols are toxic when present in a wastewater at higher concentration. No significant toxicity of phenol was observed below 500 mg/L [Duff *et al.*, 1995]. However, inhibition of methanogenesis was consistently observed between 2 to 3 mg/L PCP for batch toxicity test.

The effect of Chromium (Cr III) and Cadmium (Cd) on the anaerobic acidogenesis of simulated dairy were examined using serum vials. At Cd dosage less than 20 mg/L the acidogenesis process was enhanced by the dosage, resulting in higher degree of acidification. At dosage over 20 mg/L, Cd inhibited the acidogenesis. At Cr (III) exceeding 5 mg/L sever inhibition on acidogenesis was reported [Yu H.Q. *et al.*].

