Effect of Volatile Fatty Acids and Trimethylamine on Denitrification in Activated Sludge

The effect of volatile fatty acids and trimethylamine on denitrification activity of activated sludge was studied in laboratory batch experiments. Formic acid had no effect on the denitrification rates. Acetic acid, n-butyric acid and trimethylamine all enhanced the rates. Acetate is the compound with the strongest effect, n-butyric acid has a moderate effect, while TMA only have a small effect in stimulating the rates. Propionic, iso-butyric, n-valeric, iso-valeric and caproic acid inhibit denitrification, nitrate reduction being more inhibited than nitrite reduction. The inhibitor concentration, KI, at which activity falls to 50% of the activity measured when no inhibiting compound were present, were determined by modelling. KI values for nitrate reduction, in a media not supplemented with an easily metabolised electron donor, were found to be 74 mM for propionic, 30 mM for iso-butyric, 36 mM for n-valeric, 18 mM for iso-valeric and 105 mM for caproic acid. KI values for nitrite reduction were found to be 196 mM for propionic, 32 mM for iso-butyric, 57 mM for n-valeric, 18 mM for iso-valeric and 110 mM for caproic acid. Inhibition of the rate of hydrolysis could not be determined. Anaerobically treated wastewaters from fish, potato and onion industries all stimulated denitrification. Reject water from anaerobic treatment of excess sludge had no significant effect on the denitrification processes. For iso-butyric, iso-valeric and n-valeric acid the undissociated compounds appear to act as the inhibitor. For propionic acid it could not be assessed whether the degree of inhibition were determined by the undissociated or the total concentration of the inhibitor.

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