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Effects of trace metal deficiency and supplementation on a submerged anaerobic membrane bioreactor

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Abstract

This study examined the effects of a deficiency in trace metals (TMs) on the performance of a submerged anaerobic membrane bioreactor (SAMBR). When trace metals were excluded from the feed to the SAMBR, COD removal and methane yield reduced while VFAs in the effluent increased. A reduction of up to 37.48% in the total metal content in the reactor was observed, while the less bioavailable fractions increased up to 13.29%. Pulse addition of trace metals for 7 days at 5-times the daily metal loading was effective in improving the performance of the SAMBR by increasing the amount of trace metals in the bioavailable fractions from 2.12% to 11.92%, with up to 87.7% of added metals retained in the reactor within 24 h. However, the second and third pulse at 5 and 10-times daily metal loading did not result in similar changes in metal speciation and might have inhibited the methanogens.

Keywords: trace metals; speciation; bioavailability; dosing strategy; anaerobic membrane bioreactor

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