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BIODEGRADATION AND SORPTION OF 17 α -ETHINYLESTRADIOL IN SUBMERGED MEMBRANE BIOREACTOR: EFFECT OF INITIAL AMMONIUM CONCENTRATION

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Abstract

Batch experiments were done to assess the removal of 17 α -Ethinylestradiol (EE2) using sludge acclimated from a lab-scale submerged membrane bioreactor (SMBR). Though activated sludge (AS) was found to effectively remove EE2 from wastewater, membrane bioreactor showed a faster rate of removal. Results obtained revealed that EE2 was removed completely within 18 h in SMBR while it took 96 h in AS. The removal of EE2 fits first-order rate reactions with a kinetic rate constant, k , of 0.96 d⁻¹ and 6.96 d⁻¹ for AS and SMBR, respectively. This showed that EE2 rate of removal using SMBR sludge is 7X faster than using AS. The role of nitrification in enhancing the removal of EE2 was investigated in terms of the effect of different initial ammonium concentration on both sorption and biodegradation. As the initial ammonium concentration is increased, biodegradation of EE2 is enhanced whereas sorption of EE2 onto the SMBR biomass is decreased. Sorption studies revealed that competition for sorption sites happened between ammonium ions and EE2. The partitioning coefficients, K_D were 0.31 L (g_{MLSS})⁻¹ and 0.09 L (g_{MLSS})⁻¹ for SMBR and AS, respectively. These results showed that EE2 adsorbed more to SMBR sludge than to AS. Results of this study suggest that MBR improves the biological removal of EE2.

Key words: 17 α -Ethinylestradiol, biodegradation, membrane bioreactor, sorption

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