Removal of nutrient, linear alkyl benzene sulphonate, and caffeine from synthetic wastewater with an algal-bacterial culture and an activated sludge culture in batch mode

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Abstract

An algal-bacterial culture and an activated sludge culture were cultivated for simulating macro- and micro-pollutant removals from wastewater in an algal pond and an aerated pond, respectively. Linear alkyl benzene sulfonates (LAS) and caffeine were selected as model micro-pollutants. In the 7-days batch treatment of synthetic wastewater (total organic carbon (TOC) 106 mg/L, total nitrogen (TN) 57 mg/L, total phosphorous (TP) 6.7 mg/L, LAS 16 mg/L, caffeine 0.03 mg/L), the degradation kinetics for LAS and sulfophenyl carboxylic acids as the intermediates, and caffeine suggested that the bacterial species and populations in the activated sludge culture and the algal-bacterial culture were quite different each other. Finally, the algal-bacterial culture showed balanced removals for the pollutants (TOC 82%, TN 32%, TP 72%, LAS 100%, caffeine 50%). While the activated sludge culture showed rapid degradation of LAS and caffeine but insufficiently removed nutrients (TOC 73%, TN -20%, TP 23%, LAS 100%, caffeine 63%). The algal pond is a promising technology for simple and low-cost wastewater treatment in warm countries.