

Structural analysis of anaerobic granule sludges in UASB reactor treating PTA wastewater by SEM and FISH combined with CLSM

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Purified terephthalic acid (PTA) manufacturing industry generates a high-strength organic wastewater containing acetate, terephthalate, benzoate and p-toluate (pTOL) as major pollutants. This PTA wastewater is usually treated by an anaerobic process, which is achieved by a syntrophic culture system where diverse acidogenic and methanogenic microbes are involved. In this study, we operated a two-stage UASB process using a synthetic PTA wastewater. It was found that all the major pollutants except pTOL were completely degraded in the first reactor and the remaining pTOL was removed in the second reactor. Also, difference of microbial population of granule samples obtained from each stage was also investigated by using fluorescence in situ hybridization (FISH) technique. In situ hybridization with bacterial- and archaeal-domain probes within granule sections clearly showed that both first reactor and second reactor granules had different layered structures. In the results of microbial community analysis, the granule of first reactor was mostly dominated by the methanogenic archaea cells whereas the granule of the second reactor was dominated by the acidogenic bacteria cells.