S09-1

Microbial community and functions of low-strength methane fermentation process with no temperature control.

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無加温・低濃度メンテ発酵プロセスの微生物群集構造と機能

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Key word: microbial community structure, microbial function, methane fermentation process, low-strength organic wastewater treatment

Methane fermentation process is one of well-established anaerobic wastewater treatment technologies for high-strength organic wastewater, and it has also been used for treating low-strength organic wastewaters like municipal wastewater. A number of such full-scale, municipal wastewater-treating methane fermentation processes are successfully used in tropical and subtropical countries, in which they are operated without temperature control. However, the system is known to be susceptible to temperature variation, and therefore seasonal modulation in temperate climate countries often makes the system unstable. To understand the mechanisms underlying the instability, we surveyed the microbial community structure and its shift by seasonal modulation in anaerobic sludges taken from several municipal sewage-treating Upflow Anaerobic Sludge Blanket (UASB) reactors based on 16S rRNA genes. Bacterial and archaeal 16S rRNA gene clone libraries were constructed from sludge samples collected in summer and winter. Phylogenetic analyses revealed that unique and common microbial constituents in sludges were indicated, also the presence the uncultured phylotypes commonly and dominantly observed in UASB reactor treating municipal wastewater. These results suggest the importance of the microbial community structure and the phylotype in municipal wastewater-treating UASB process.

S09-2

Bacterial activation with gentle incubation by a novel bioreactor equipped with a microbubble generator by an oscillating porous board

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穏やかに培養して微生物を高活性化する振動多孔板を用いた微細気泡発生バイオリアクター

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Key word: bioreactor, microbubble, oscillating porous board, gentle incubation, bacterial activation

Microorganisms in the aeration tank of the biological wastewater treatment plants are under the stress of insufficient oxygen concentration and share stress by water flow. Since the aeration is the most energy consuming process in the biological wastewater treatment, which occupies about 50% of energy consumption of wastewater treatment plants, microscale-bubble-generating aerator have been introduced in some wastewater treatment plants. However, it is still largely unknown how such microscale bubbles are effective for microbial life and activity. Authors developed a novel palm-sized microbubble generator by using an oscillating porous board (MiBos). The MiBos generated a large number of microscale bubbles through the porous board being oscillated by an ultrasonic with a few volts. The MiBos bioreactor enhanced oxygen transfer efficiency and allowed a precise control of dissolved oxygen concentration in the reactor. *Escherichia coli* cultivated by the MiBos bioreactor had a higher organic carbon utilization rate than a normal shaking incubation. Fluorescent lectin-based staining technique revealed that amount of extracellular polymeric substances (EPS) of *E. coli* was significantly reduced by the MiBos bioreactor cultivation. The MiBos bioreactor probably provides an efficient cultivation environment for *E. coli*. 

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