High performance of a pilot scale ZVI-UASB reactor for real dye wastewater treatment

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Massive discharge of dye wastewater from textile factories and chemical industries seriously threats to ecological safety and human health. Considering that zero-valent iron (ZVI) is expected to help create an enhanced anaerobic environment due to its reductibility, a pilot-scale UASB reactor packed with a ZVI bed (ZVI-UASB reactor, R1) was enlarged from laboratory-scale to enhance actual dye wastewater treatment in Haicheng city, China. The actual wastewater was mainly composed of aze dyes, polyvinyl alcohol and surfactants. During 191 days' operation, the average COD removal maintained at about 90% with the fluctuant influent COD between 400 mg/L and 1462 mg/L, while it was only 18.3% in the local anaerobic treatment equipment. When the influent chromaticity fluctuated from 300 to 500 times, the average removal rate of chroma in reactor R1 also presented a higher performance of 93%. Granularity analysis and SEM observation showed that the average particle size of the sludge increased to 486μm, and the surface of the granular sludge is dense. FISH analysis confirmed that the relative content of archaea was increased to 62.5%, which was significantly higher than that in the local anaerobic tank (32.3%). PCR-DGGE results indicated that the ZVI increased the diversity and enrichment of microbial communities during their adaptation process for actual dye wastewater treatment. These findings indicated that the coupling of ZVI and anaerobes was useful and reliable for actual dye wastewater treatment, which is meaningful for wider application of anaerobic reactors in the wastewater treatment associated with engineering.

Biography

Jingxin Zhang is a postgraduate student from Dalian University of Technology in China, and will get his Ph.D degree in 2013. His research interests are anaerobic biological treatment of wastewater.

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