



The modified mechanism for denitrifying granular sludge formation in a UASB reactor

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ABSTRACT

Physico-chemical and microbial mechanism of sludge during granulation process in upflow sludge bed reactor were investigated in this study. Mature granules achieved high settling velocity of 186–217 m/h, low VSS/SS of 0.34 and a nitrate loading rate of 2.61 kgNO₃⁻-N/(m³·d). Scanning electron microscopy photographs showed that granular sludge surface was dominated by rod-like bacteria wrapped by filamentous substances such as extracellular polymeric substances (EPS) and fungus. Ca and Mg content of sludge increased from 50.3 to 127.6 mg/g SS and from 4.6 to 8.1 mg/g SS, respectively. EPS content increased from 68 to 88 mg/g VSS, and the ratio of protein to polysaccharides increased by 3-fold. Isolated *Fusarium oxysporum* fungi-1 played a key role in granulation process. Base on the results, a modified five-step granulation mechanism to describe the denitrifying granular sludge was proposed based on mechanism of extracellular polymer hypothesis.

Keywords: Granulation mechanism; Denitrifying granular sludge; EPS; Ca accumulation; Fungi

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