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KEY WORD: UASB / GRANULATION / SLUDGE BLANKET / NICKEL / COBALT

NARONGSAK THITITHANYANONT : EFFECT OF NICKEL AND COBALT IONS ON THE PERFORMANCE OF UASB. THESIS ADVISOR : ASSO.PROF. MUNSIN

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Nickel and cobalt are the important part of the essential enzymes in the metabolism of methanogenic bacteria which is usually found in the sludge bed and necessary for the UASB system. This study was carried out to investigate the effect of nickel and cobalt ions on the UASB system performance and physical characteristics of sludge.

This study consisted of 2 sets of experiment. In the first experiment, the influent COD was 3000 mg./l, the organic loading rate was 12 kg. COD/m³-day and the hydraulic retention time was 6 hr. In the second experiment, the influent COD was 4500 mg./l, the organic loading rate was 18 kg. COD/m³-day and the hydraulic retention time was 6 hr. Each set of experiment consisted of 3 individual runs with different metal addition as follows : 1) adding nickel and cobalt (R1), 2) adding nickel only (R2) and 3) adding cobalt only (R3). Synthetic wastewater was prepared by diluting concentrated pineapple juice with tap water and adding sufficient nitrogen and phosphorus nutrients. The ratio of COD to nickel and cobalt ions addition was 100 : 0.008 : 0.008 respectively.

In the first experiment, the result indicated that the COD removal efficiency of both UASBR#1 and UASBR#3 was 90%, while the COD removal efficiency of UASBR#2 was 60%. The methane yield of UASBR#1, UASBR#2 and UASBR#3 was 0.24, 0.19 and 0.22 liters/g. COD removed and the percentages of methane in biogas were 66%, 48% and 62% respectively. The sludge color of UASBR#1 and UASBR#3 was black and dark gray respectively, while the sludge color of UASBR#2 was yellowish white. Furthermore, the sludge granule diameter of UASBR#1, UASBR#2 and UASBR#3 were about 3, 3.5 and 4.5 mm., respectively. In the second experiment, the result indicated that the COD removal efficiency of UASBR#1 and UASBR#3 were 62% and 80% respectively, while COD removal efficiency of UASBR#2 was 60%. The methane yield of UASBR#1, UASBR#2 and UASBR#3 was 0.29, 0.28 and 0.23 liters/g. COD removed and the percentages of methane in biogas were 53%, 48% and 60% respectively. The sludge color of UASBR#1 and UASBR#3 was dark gray and white, and dark gray respectively while the sludge color of UASBR#2 was light brown. The sludge granule diameter of UASBR#1, UASBR#2 and UASBR#3 were about 4.5, 3.5 and 4 mm., respectively.

In conclusion, cobalt addition significantly increases the efficiency of UASB system and blackens the sludge bed color, meanwhile nickel addition also increases the system efficiency but to a lesser degree. Furthermore, the dark color sludge bed (black, dark gray) tends to remove COD better than the light color sludge bed (light brown, white).

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