



## STUDYING EMERGENT POLLUTANTS DEGRADATION: SLUDGE ACTIVATED ADAPTATION IN SYNTHETIC WASTEWATER TO AVOID BULKING FORMATION

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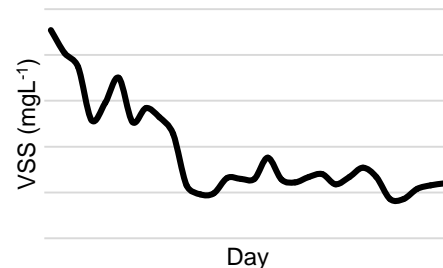
*Key words: Bulking, wastewater, operation conditions*

**Introduction.** Because the variability of wastewater, effective research systems for elimination of pollutants contained in wastewater require a synthetic media based on components, concentration and characteristics of real municipal wastewater. Furthermore, simulated wastewater promotes growth of filamentous microorganism (bulking) which should be avoided in the municipal wastewater treatment plants. The objective of this work was to find the operation conditions to avoid the bulking formation of activated sludge in standardized synthetic municipal wastewater.

**Methods.** The activated sludge was obtained from an industrial wastewater treatment plant. The composition of the synthetic municipal wastewater was prepared according to ASTM formulation [1], in addition to CaCO<sub>3</sub> and NH<sub>4</sub>Cl (62.5 and 3 mgL<sup>-1</sup>, respectively). A bioreactor type Ekckenfelder (10 L working volume or total volume) was operated during 40 days using synthetic wastewater inoculated with 2270 mg L<sup>-1</sup> of volatile suspended solids (VSS). The cellular retention time (12h and 2 days) and ratio Food/Microorganisms (F/M) were varied in order to avoid bulking formation (0.2-1 mg COD/day-mg VSS). VSS, O<sub>2</sub>, pH and chemical oxygen demand (COD) were evaluated during the experiment. Samples were taken constantly for microscopic observation.

**Results.** Operation conditions for no bulking formation of the bioreactor were: pH values were 7.5 ± 0.3 for the sludge and 7.8 ± 0.2 for the influent, the F/M ratio was in the range of 0.4 ± 0.2 and dissolved oxygen value was 4.1 ± 2.4 mg L<sup>-1</sup>, when the F/M ratio and dissolved oxygen increased, bulking was observed in the bioflocs. This results were similar to those reported previously [2, 3]

The VSS values achieved the steady state at day 11<sup>th</sup>; VSS was kept at 500 VSS until the end of the study (Fig. 1). While COD removal was kept in 90% during the full operation of the bioreactor (Fig. 2). No bulking formation was observed at any moment.



**Fig. 1** Volatile Suspended Solids concentration during the reactor operation using synthetic municipal wastewater



**Fig. 2** Chemical Oxygen Demand removal by the activated sludge during the reactor operation using synthetic municipal wastewater

**Conclusions.** It was possible to avoid filamentous growth of an activated sludge in an Ekckenfelder reactor by means of F/M ratio, oxygen dissolved and pH control in standardized synthetic municipal wastewater. Additional NH<sub>4</sub>Cl was necessary as nutrient. It's possible to use standard synthetic wastewater for studying drug degradation under conditions similar to those present in real systems.

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### References.

1. ASTM International. D 5905-98 Standard Practice for the Preparation of Substitute Wastewater. United States. 2008. pp 1-3.
2. Grady L., Glent D, Henry L (1999). *Biological Wastewater Treatment*. Marcel Dekker Inc. Second Edition. EE.UU. pp. 389-400.
3. Palm JC, Jenkins D, Parker D (1980). *Journal WPCF*, 52 (10):2484-2506.