

## Wastewater Treatment

### Effect of carotenoids production by strain *Rhodotorula mucilaginosa* F-1 using food wastes

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Production can be mainly divided into chemical and natural biomass extraction. They are extensively used as preservatives, food and cosmetic additives and health food. Due to the concern of health, natural carotenoids demands have increased in recent years. In this research, yeast *Rhodotorula mucilaginosa* F-1 was isolated and its optimum temperature for carotenoids synthesis were determined. Carotenoids composition was also determined by HPLC chromatography and chelation experiment. To increase the source of natural carotenoids, food wastes (tomato sauce and molasses) were used as sources to evaluate the feasibility of carotenoids production. The results indicated the optimum temperature for carotenoids synthesis were 5 and 25°C, respectively. The main components of carotenoids in *Rhodotorula mucilaginosa* F-1 were  $\beta$ -carotene and torularhodin. The percentages of  $\beta$ -carotene and torularhodin under the optimum condition (pH5 and 25°C) were 28.8%, 48.0% and 23.2%, respectively. The cell growth and carotenoids synthesis in wastewater were both better than those using YM20 medium (control). Total carotenoids was 2611  $\mu\text{g/L}$  which was 2234.9  $\mu\text{g/L}$  as tomato sauce as the medium. Its composition was 23.8%  $\beta$ -carotene, 67.5% torularhodin. Molasses might be a potential cost and natural carotenoids production.

Keywords: *Rhodotorula mucilaginosa*; molasses; chromatography

### Aerobic Sludge Granulation at High Temperature-Low Humidity for Domestic Wastewater Treatment

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#### Abstract

With inoculum sludge from a conventional activated sludge wastewater treatment plant, a sequencing batch reactor fed with domestic wastewater was operated at  $50 \pm 1$  °C and pH  $7 \pm 1$  to study the formation of aerobic granular sludge (AGS) for simultaneous organics and nutrients removal with a complete cycle time of 3 h. The AGS were successfully cultivated with excellent settling ability and demonstrated exceptional performance in the organics and nutrients removal with influent loading rate and COD/N ratio of  $1.6 \text{ kg COD (L.d)}^{-1}$  and 8.3, respectively. Stable, regular, dense and fast settling granule (average diameter, 1.5 mm; settling velocity,  $33 \text{ m h}^{-1}$ ; and sludge volume index,  $22.3 \text{ mL g}^{-1}$ ) were developed in a single reactor. In addition, 96.5% COD removal efficiency was observed in the system at the maturation stage of the granulation, while its ammonia and total nitrogen removal efficiencies were up to 94.7% and 89.4%, respectively. The study demonstrated the capabilities of AGS formation in a single, high and slender column type-bioreactor at high temperature which suitable to be applied for hot climate and low humidity countries (e.g. Saudi Arabia).

Keywords: Aerobic granular sludge; Sequencing batch reactor; High Temperature

### Fixed bed column treatment of acid blue 113 azodye with resin supported iron/nickel nanoparticles

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#### Abstract

Nano scaled zero-valent metal was proved to decolorize dye wastewater effectively. However, nano scaled size makes the operation of this technology very difficult. In this work, cat-ion exchange resin was utilized as nano scale metal carrier to reach both high treatment efficiency and better operation. A set of batch experiments were conducted to investigate the effects of operating parameters prior to the column test. From