

Supplementary materials

S1. SAN recover method

In order to realize the recycling of SA, a modified high-temperature- Na_2CO_3 extraction method was adopted to recover SA from the remaining sludge in each AGS system after the experiment, as follows:

- ✧ Transfer 3 g (wet weight) sludge particles to 250 mL conical flask and add deionized water to 50mL conical flask.
- ✧ 0.5% (W/V) of Na_2CO_3 was obtained by adding 0.25 g anhydrous Na_2CO_3 or 0.67 g $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ to the conical flask.
- ✧ Place the conical flask containing the mixture into a water bath. Cover the flask and beaker separately with aluminum foil to prevent evaporation. Stir at 400 r/min at 80 °C for 35 minutes.
- ✧ The mixture was transferred to a 50 mL centrifuge tube and centrifuged at 4000 r/min for 10min.
- ✧ The collected supernatant is the SAN solution.

S2. SAN recovery data

In the case of other conditions unchanged, we also carried out multiple phase (phase 3 and phase 4) of the experiment. The EPS content and SAN recovery in each phase of the experiment are as follows:

In the phase 3 (P3), different OLR (0.8~1.0 $\text{kg}/\text{m}^3 \cdot \text{d}$, 1.4~1.6 $\text{kg}/\text{m}^3 \cdot \text{d}$, 2.2~2.4 $\text{kg}/\text{m}^3 \cdot \text{d}$) synthetic wastewater were added into 3 reactors (Label as P3-R1, P3-R2, P3-R3). In the phase 4 (P4), different C/N ratio (10 ± 1 , 15 ± 2) were designed, label as P4-R1, P4-R5.

The variation of PN and PS content in 2 phase during granulation as follows (Fig. S1, Fig. S2). The recovery efficiency of SAN in each group is shown in Fig. S3. And Figure. S4 shows the relationship between SAN recovery efficiency and PN/PS.

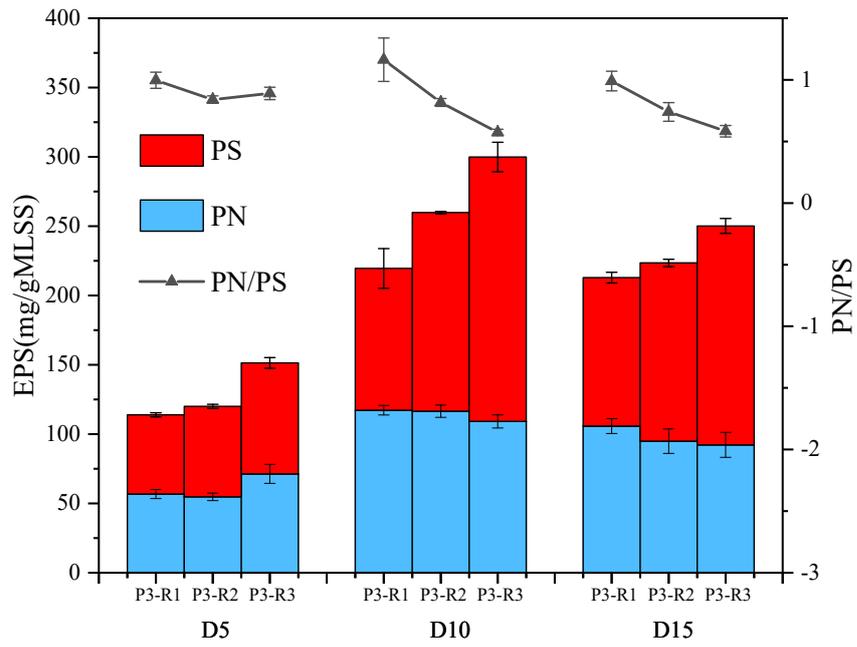


Fig. S1. Variation of PN and PS content in phase 3 during granulation.

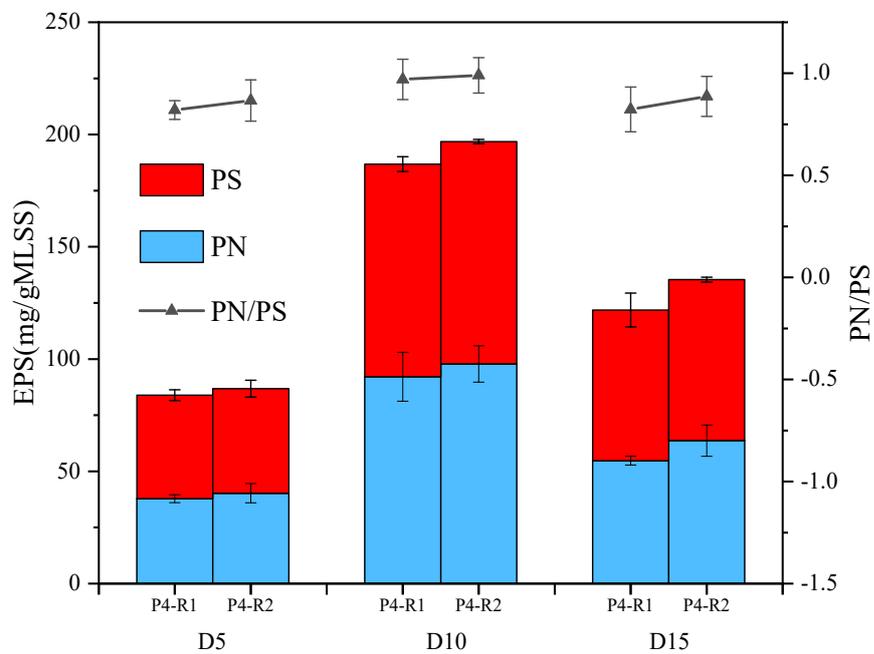


Fig. S2. Variation of PN and PS content in phase 4 during granulation.

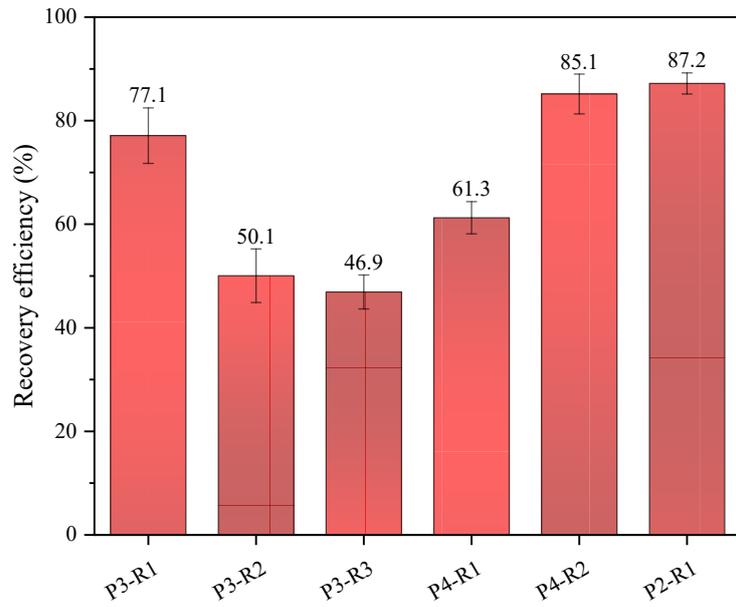


Fig. S3. Recovery efficiency of SAN in excess activated sludge

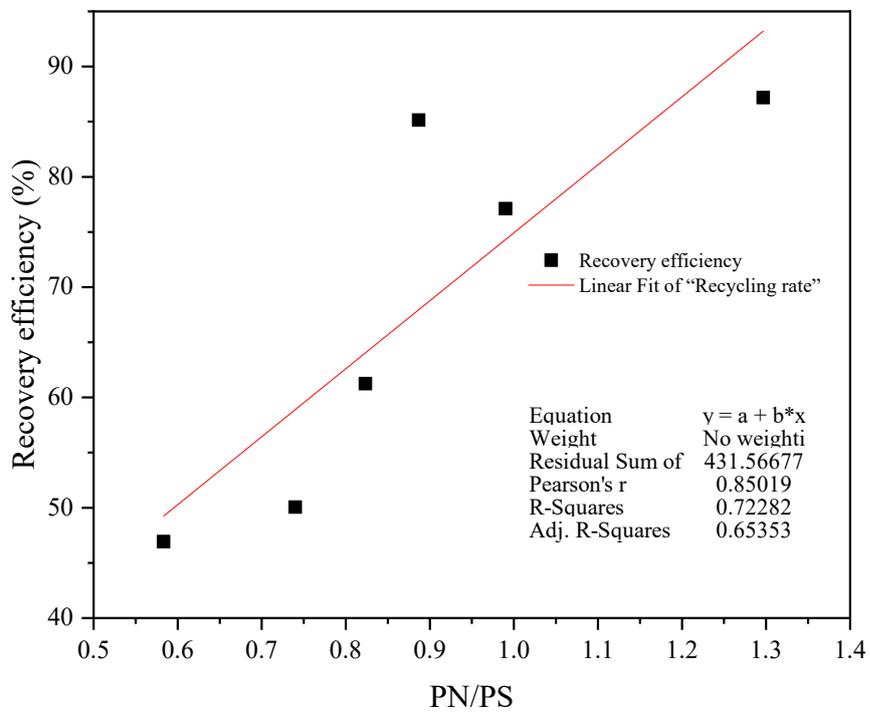


Fig. S4. Correlation between SAN recovery efficiency and PN/PS

The recovery efficiency of SAN was positively correlated with PN/PS (Fig. S4), the more PN in the EPS, the stronger the hydrophobicity of the sludge, and sludge particle compatibility with water decreased, resulting in enhanced sedimentation performance (Geng et al., 2020), good granulation effects and easier recovery of SAN.

References:

Geng M, Ma F, Guo H, Su D (2020). Enhanced aerobic sludge granulation in a Sequencing Batch Reactor (SBR) by applying mycelial pellets. *Journal of Cleaner Production*, 274: 123037. Doi:<https://doi.org/10.1016/j.jclepro.2020.123037>