

Table. S1 Operation status and setup conditions of the reactor under different C/N

Phase	COD (mg/L)	SO ₄ ²⁻ (mg/L)	NO ₃ ⁻ (mg/L)	C/N ratio -	HRT (h)
(day1-day20)	2350	930	460	8	24
(day20-day40)	1600	930	460	5	24
(day40-day60)	1000	930	460	3	24

Table. S2 Diversity indices analysis of the two activated sludge samples

Sample\Estimators	sobs	shannon	ace	chao
Ra1	274	2.62	323.92	327.47
Ra2	303	3.64	332.96	331.70
Ra3	211	1.83	259.61	246.84
Rb1	338	3.60	381.80	395.00
Rb2	302	3.83	319.01	316.50
Rb3	258	3.32	277.60	274.00

Table S3 level abundance table of metabolic pathways

Pathway level 2	Ra1	Ra2	Ra3	Rb1	Rb2	Rb3
Amino Acid Metabolism	4459557	3760897	3848952	4942592	3940918	3922775
Carbohydrate Metabolism	3814239	3506845	3372168	4581178	3640107	3550184
Energy Metabolism	2541626	2057980	2466678	2743769	2053894	2248360
Lipid Metabolism	1513441	1206637	1356022	1624272	1353062	1370983
Nucleotide Metabolism	1507718	1200584	1190748	1520437	1174747	1185247
Xenobiotics Biodegradation and Metabolism	1069169	1146434	1451081	1381686	1275758	1353393
Glycan Biosynthesis and Metabolism	875564	576639	822721	924050	539971	702191

Fig. S1 FAPROTAX function prediction

