Supplementary Material

Table S1 details the operation conditions and denitrification performance of the bioreactor in different stages.

Table S1
Operating condition and performance of the MBBR.

Stages	1	2	3	4	5
Time (d)	1–8	9–16	17–24	25–32	33–40
HRT (h)	24	24	24	24	24
C/N	12	12	5	5	12
DO (mg/L)	0.6	0.6	0.6	3.0	3.0
Inf-nitrate (mg/L)	102.5±2.33	100.3±1.90	101.1±1.62	100.6±1.33	101.3±1.27
Nitrate removal (%)	100±2.81	97.8±1.60	99.0±0.23	68.6±1.60	100±0.10
COD removal (%)	96.7±1.54	73.2±7.29	97.1±0.58	96.8±0.61	96.3±0.49
Nitrite production (mg/L)	0.05±0.002	0.02±0.001	0.04±0.001	32.3±1.52	0.02±0.001
Ammonium production (mg/L)	0.75±0.03	0.84±0.02	0.91±0.05	0.87±0.03	0.78±0.04
Samples	T0	T1	T2	T3	T4

Table S2 describes the measurement methods of various water quality indexes in the test.

Table S2
The index and analytical methods of water quality

Determination index	Determination method
Biomass (OD600)	Turbidity method
pH	pH meter (PB-10, Sartorius, Germany)
Nitrate	Phenol sulfonic acid method
Nitrite	N-(1-naphthalene)-diaminoethane spectrophotometer method
Ammonium	Nessler's reagent colorimetric method
TN	Alkaline persulfate oxidation method
COD	Potassium dichromate method
DO	DO meter (HI98193, HANNA, Italy)

Fig. S1 showed the contrast images of the biofilm carrier before and after biofilm

formation. As depicted in the images, the surface of the biofilm in the experimental group was covered with a large number of microorganisms (Fig. S1(b)) compared with the original biofilm sample (Fig. S1(a)).
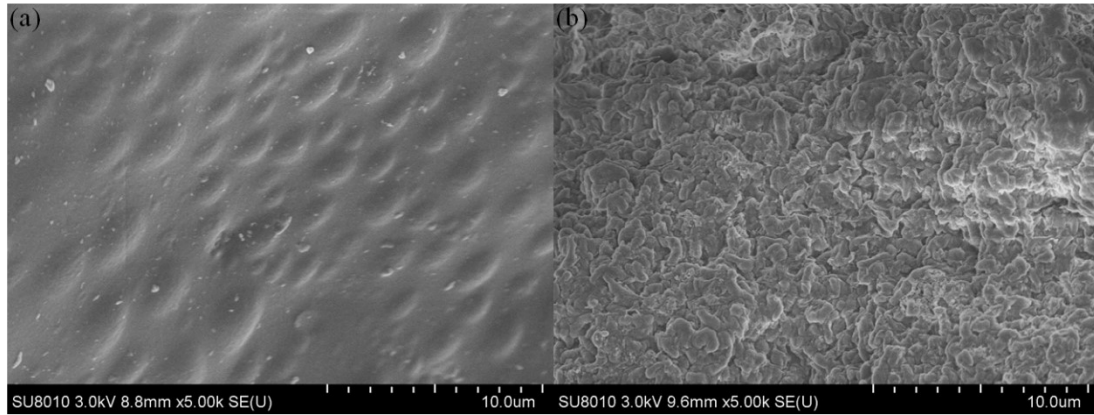

Fig. S1. SEM images of a sample of virgin surfaces of media (a) and media after biofilm formation (b).