Table 1. Model parameters

Parameter	Symbol	Value		Units	Reference
System dimensions: width, depth, height	l_x, l_y, l_z	200, 2, 200		μm	
Grid dimensions: width, depth, height	N, M, L	100, 1, 100			
Time step		1		min	
Diffusion coefficients	D			$m^2\ s^{-1}$	Picioreanu *et al.* (1997)
NH_4^+ in water		$1{\cdot}86 \times 10^{-9}$			
NO_2^- in water		$1{\cdot}7 \times 10^{-9}$			
NO_3^- in water		$1{\cdot}7 \times 10^{-9}$			
O_2 in water		$2{\cdot}0 \times 10^{-9}$			
Bulk liquid concentrations	C			mM	Picioreanu *et al.* (1997)
NH_4^+ in water		4			
NO_2^-		6			
NO_3^- in water		3			
O_2 in water		0·031			
Boundary layer thickness		40		μm	Picioreanu *et al.* (1998b)
Temperature		30		°C	Picioreanu *et al.* (1997)
pH		7			Picioreanu *et al.* (1997)
Kinetics and yields		**Ammonia oxidizer**	**Nitrite oxidizer**		
Maximum specific uptake rate of electron donor	$V_{\max,N}$	13·4	44·74	$\frac{g_N}{g_X day}$	Picioreanu *et al.* (1997)
Monod saturation constant for electron donor	$K_{S,N}$	$2{\cdot}00 \times 10^{-3}$	$2{\cdot}29 \times 10^{-6}$	mM	Picioreanu *et al.* (1997)
Monod saturation constant for electron acceptor	$K_{S,O}$	$9{\cdot}38 \times 10^{-3}$	$3{\cdot}44 \times 10^{-2}$	mM	Picioreanu *et al.* (1997)
Substrate inhibition constant	$K_{i,N}$	38·6	$1{\cdot}86 \times 10^{-2}$	mM	Picioreanu *et al.* (1997)
Growth yield on electron donor	Y_N	0·147	0·042	$g_X g_N^{-1}$	Picioreanu *et al.* (1997)
Growth yield on electron acceptor	Y_O	0·046	0·039	$g_X g_O^{-1}$	Picioreanu *et al.* (1997)
Maintenance rate	m	0	0	min^{-1}	Assumed
IbM-only parameters					
Minimal cell volume at cell division	$V_{d,\min}$	0·97	0·67	fl	Bergey *et al.* (1974)
Minimal cell volume	$V_{\min}$	$0{\cdot}2V_{d,\min}$	$0{\cdot}2V_{d,\min}$	fl	Assumed
Cell density	ρ_X	290	290	$g_X\ l^{-1}$	Shuler *et al.* (1979)
Shove radius	k	1·3	1·3		Assumed
BbM-only parameters					
Maximum biomass density	$C_{X,\max}$	Variable	Variable	$g_X\ l^{-1}$	From IbM output