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COMSOL CONFERENCE 2017 ROTTERDAM

iMETland

MODEL BASED STIMULUS EXPERIMENTS TO IMPROVE WASTEWATER TREATMENT USING ELECTRON CONDUCTIVE MATERIAL

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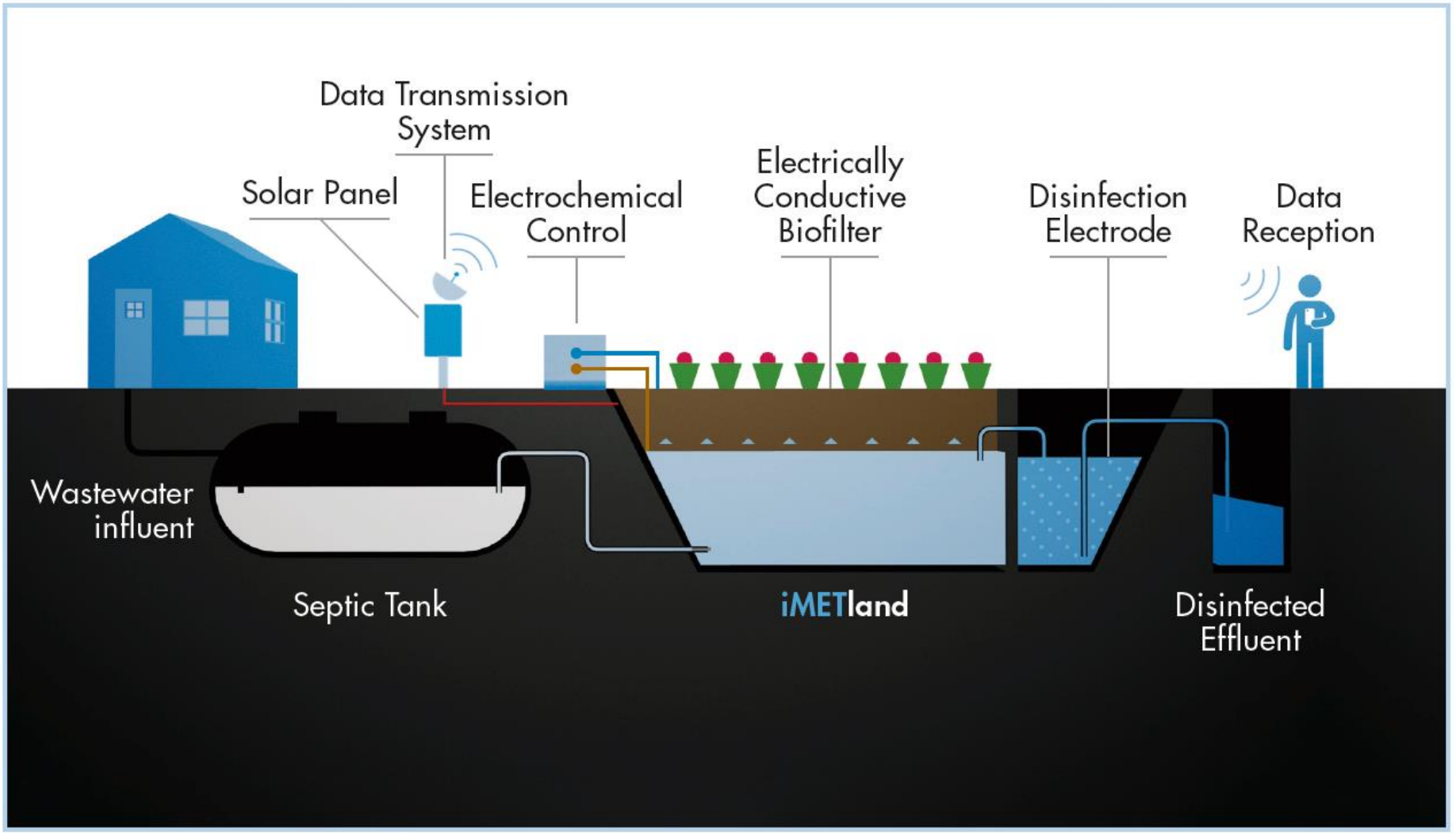
Data Transmission System
Solar Panel
Electrochemical Control
Electrically Conductive Biofilter
Disinfection Electrode
Data Reception
Wastewater influent
Septic Tank
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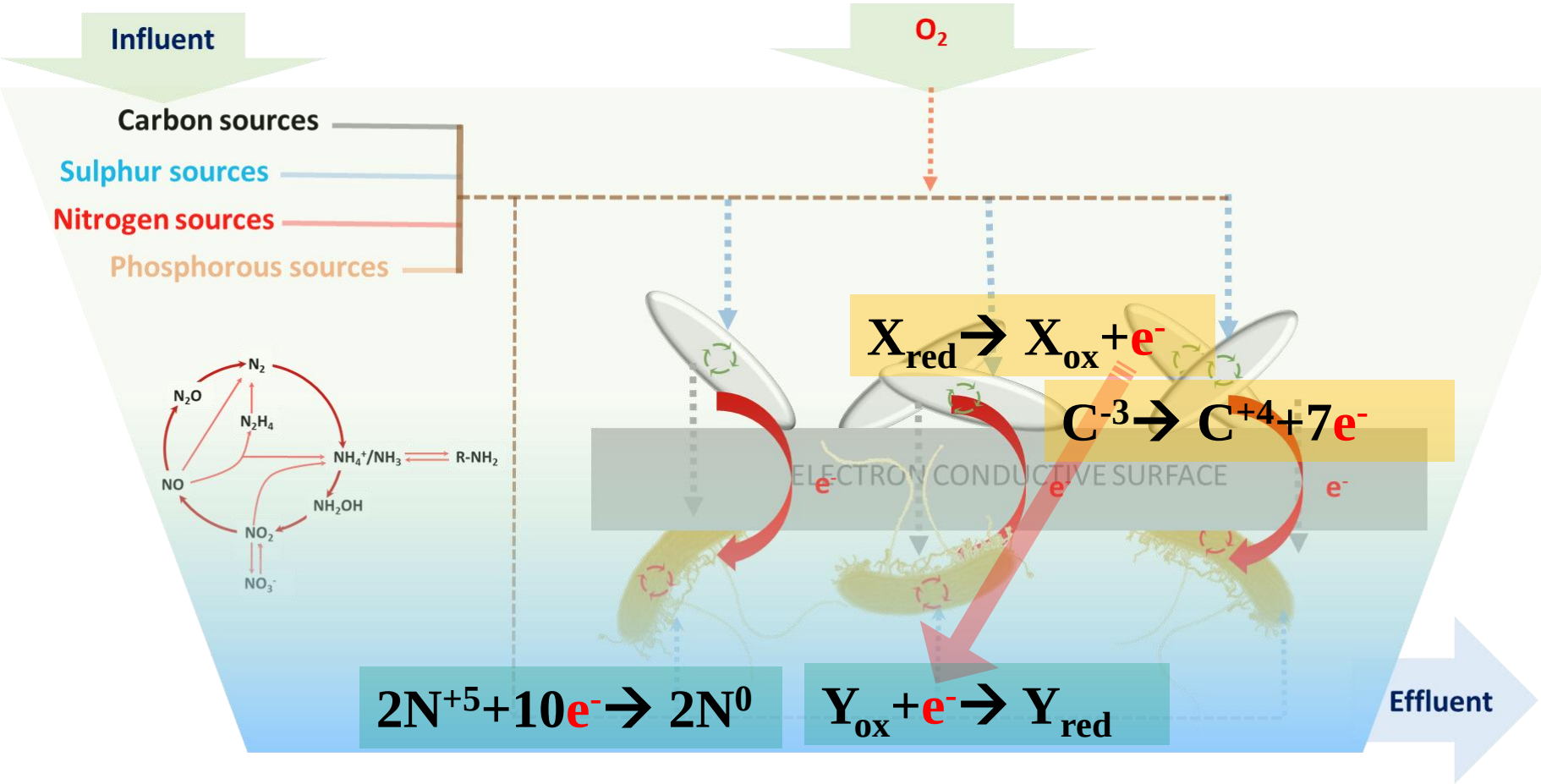
Disinfected Effluent


Influent
O_2
Carbon sources
Sulphur sources
Nitrogen sources
Phosphorous sources
N_2
N_2O
N_2H_4
NH_4^+/NH_3
R-NH_2
NO
NH_2OH
NO_2^-
NO_3^-
$X_{red} \rightarrow X_{ox} + e^-$
$C^{-3} \rightarrow C^{+4} + 7e^-$
ELECTRON CONDUCTIVE SURFACE
e^-
$2N^{+5} + 10e^- \rightarrow 2N^0$
$Y_{ox} + e^- \rightarrow Y_{red}$
Effluent

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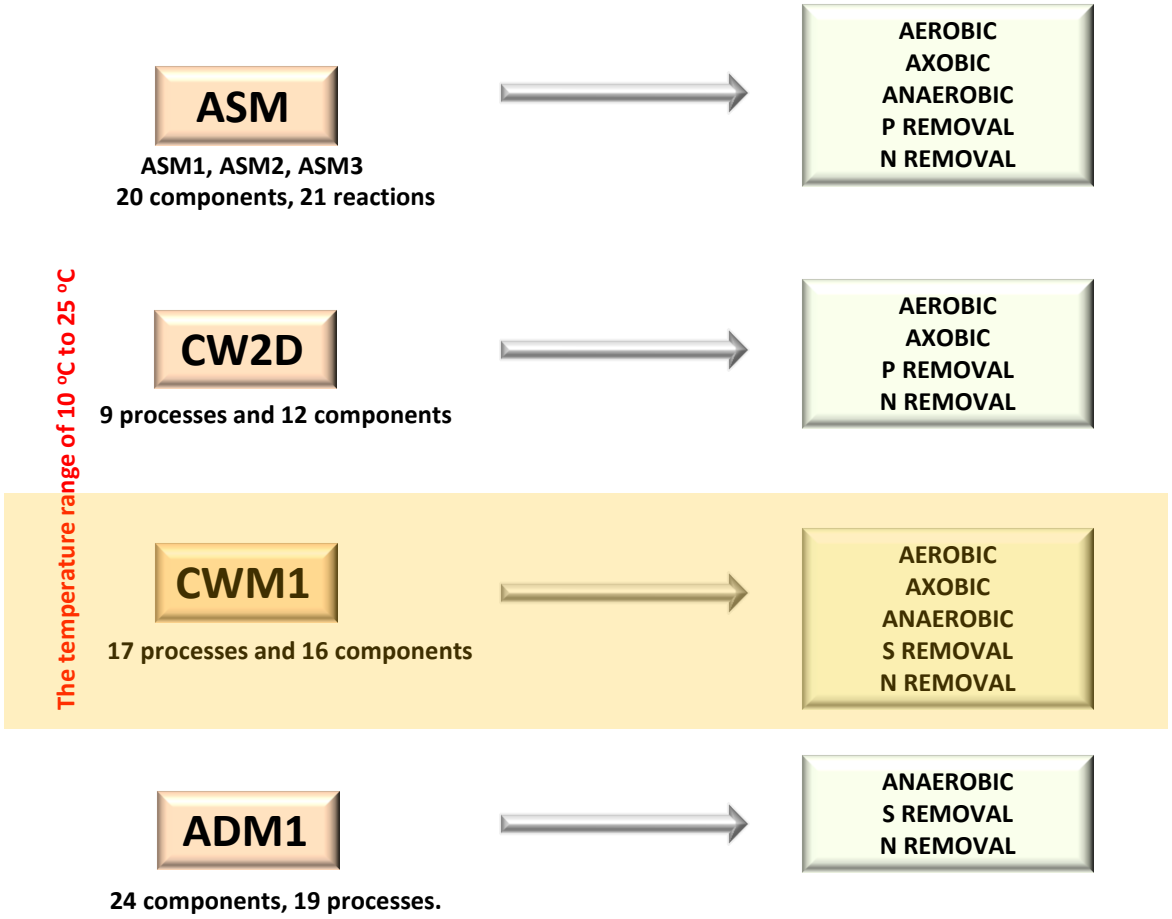
BIOKINETIC MODELS



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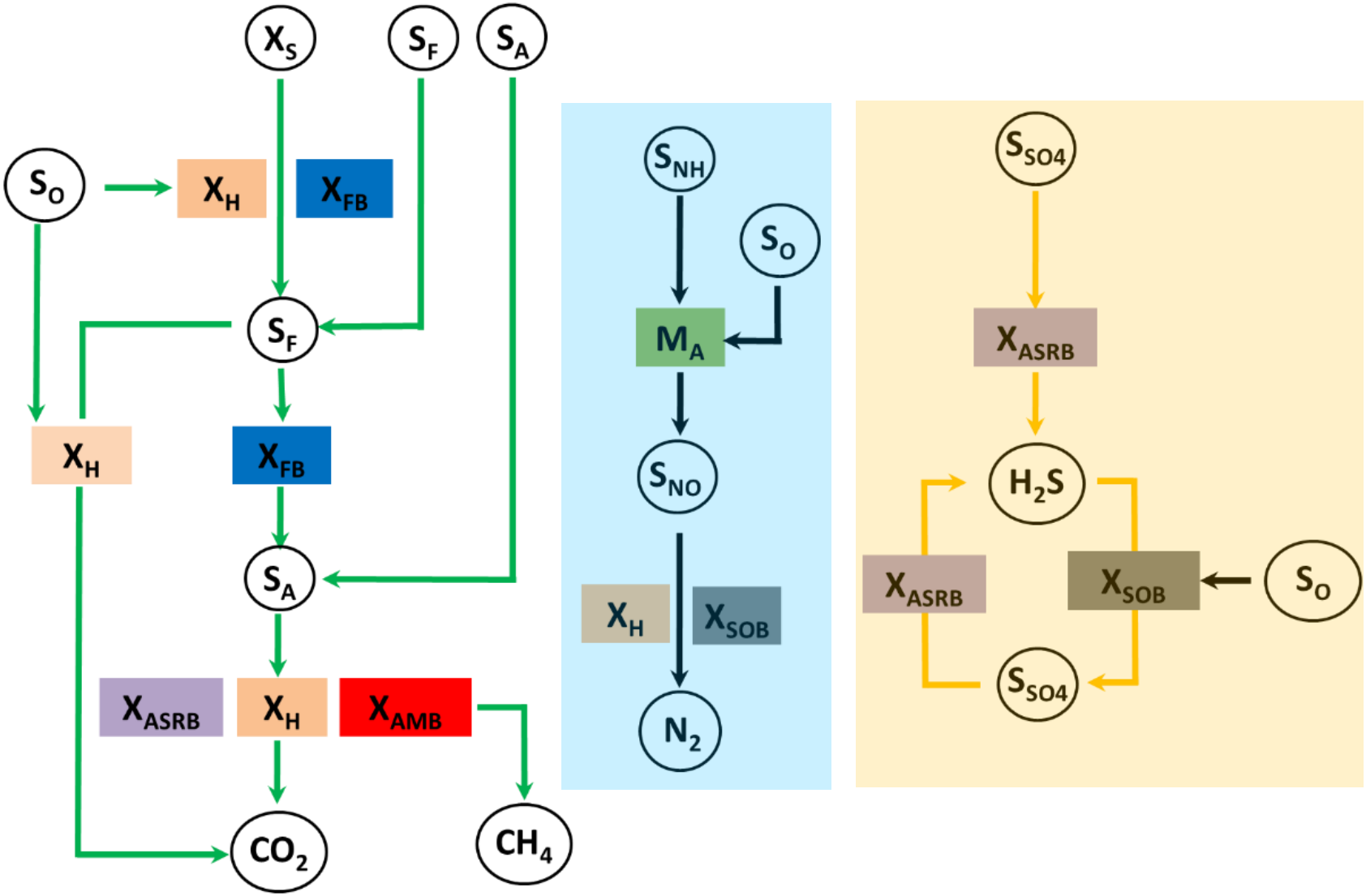
CONSTRUCTED WETLAND MODEL (CWM1)



Langergraber, G., et al., Water Sci Technol, 2009. 59(9): p. 1687-97.

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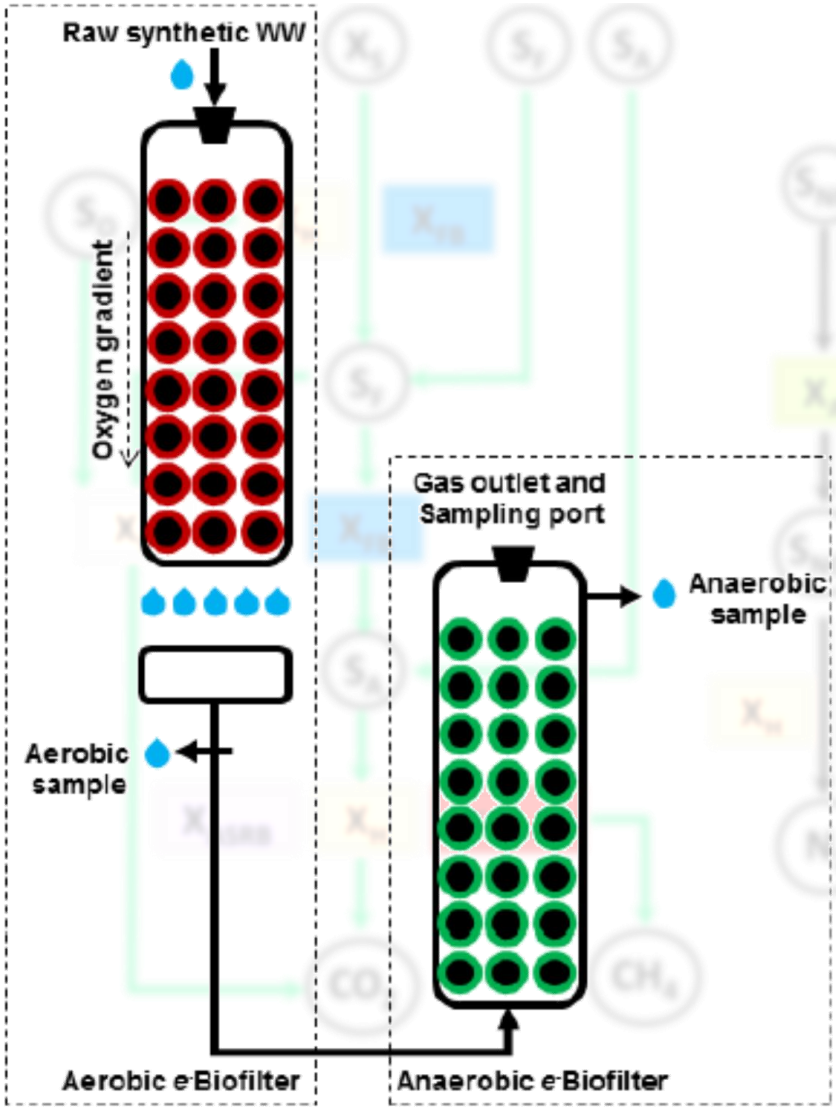
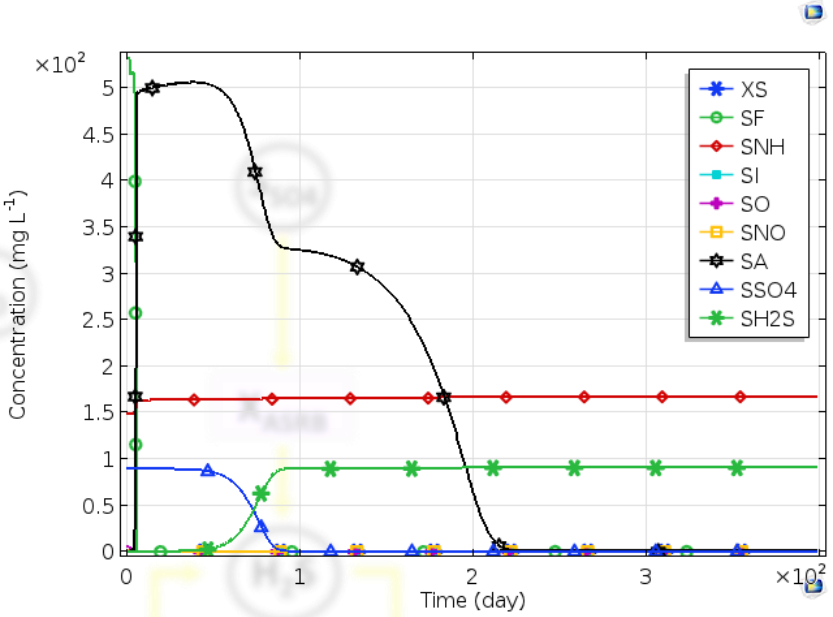
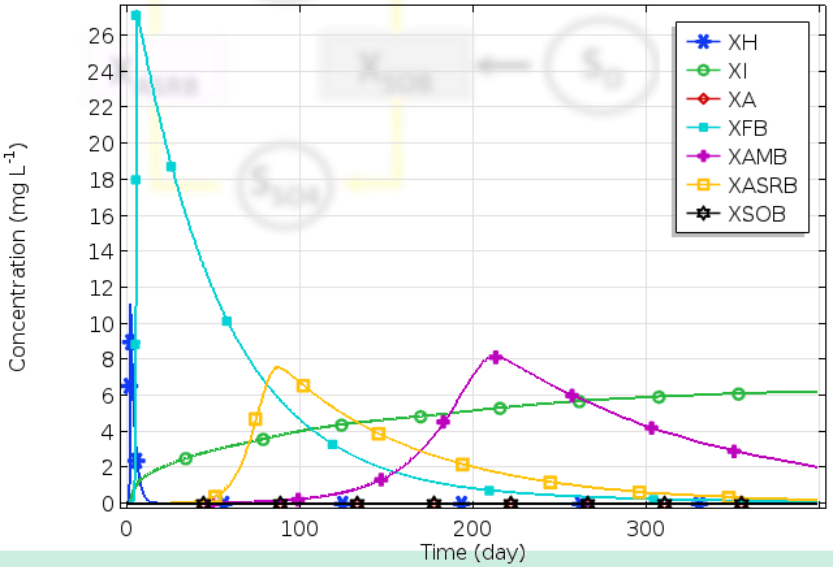
CWM1-KINETIC BEHAVIOR







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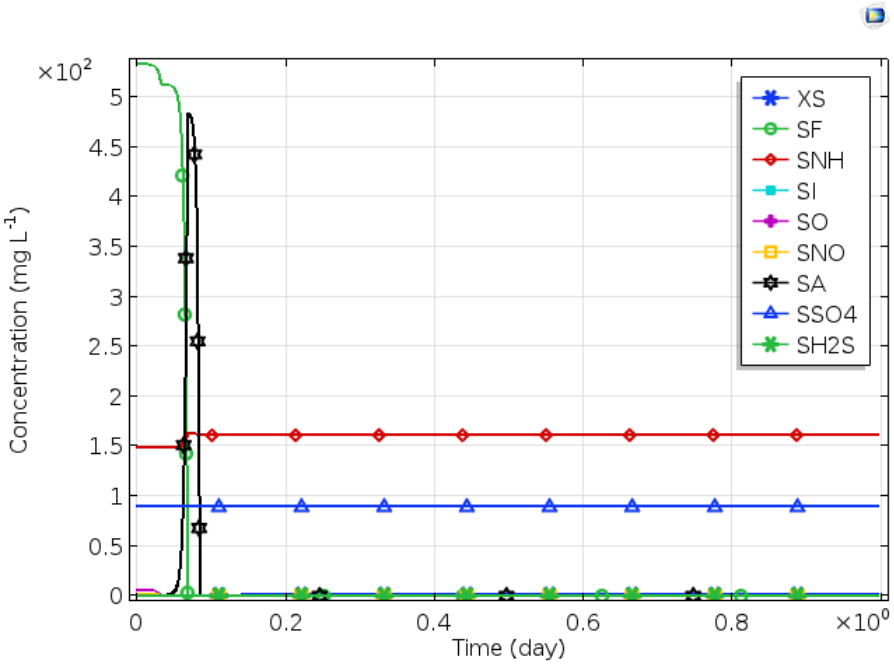
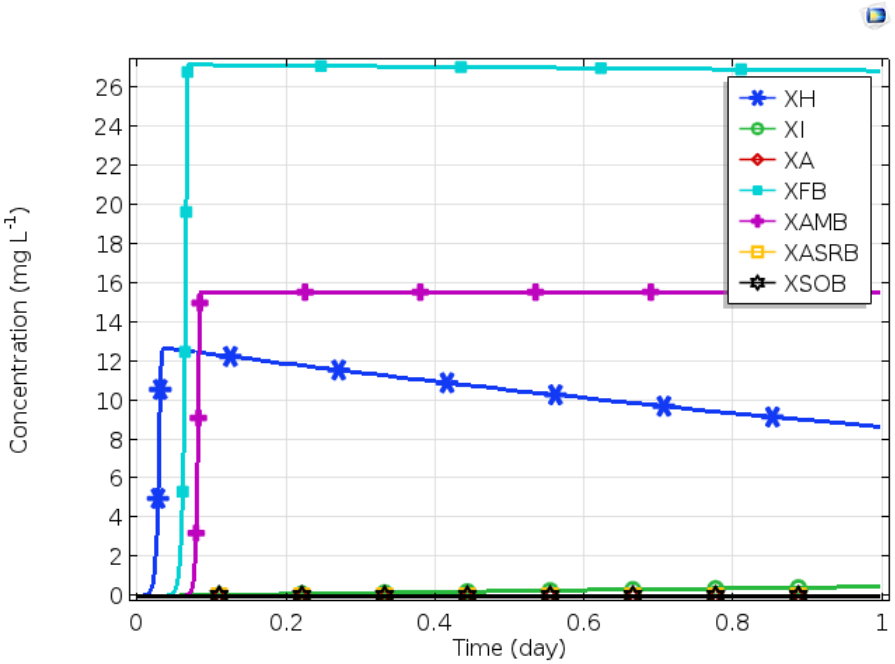
CWM1-ADJUSTED PARAMETER

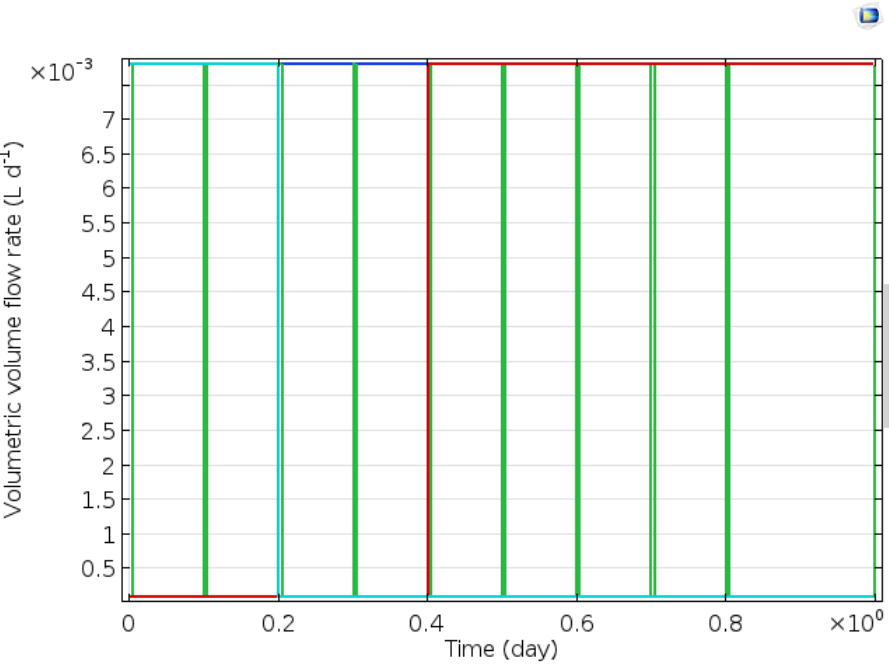




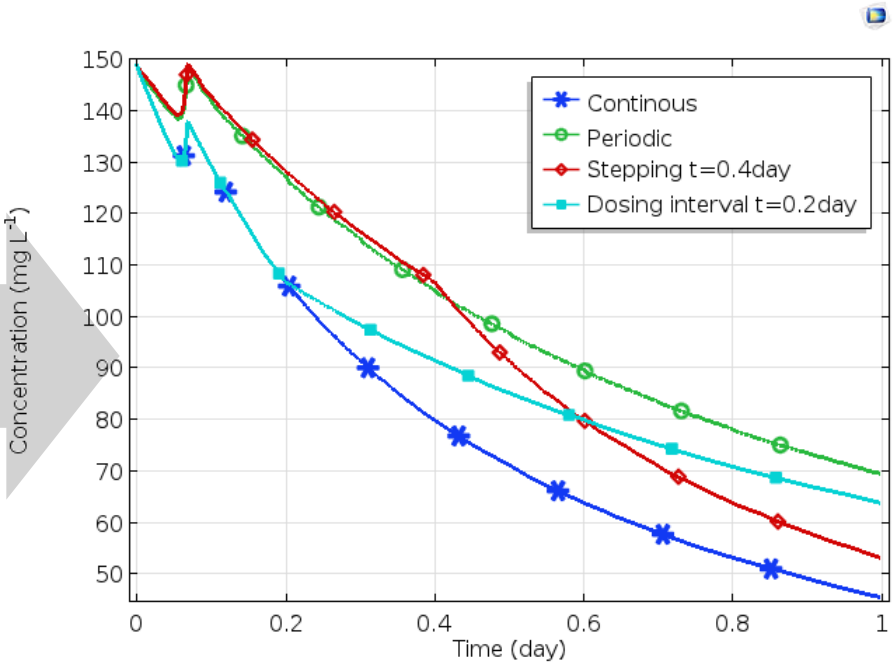
- c.a 0.1 day for completely treatment of fermentable products
- nitrogen and sulphur compounds are inefficiently treated

BATCH MODE-O_2 DOSING

Dosing scheme

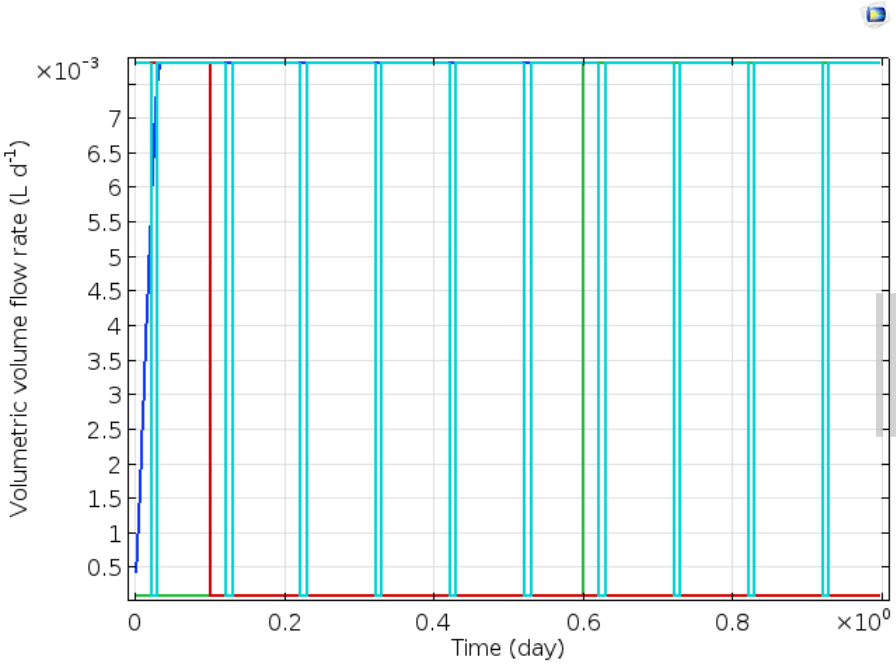


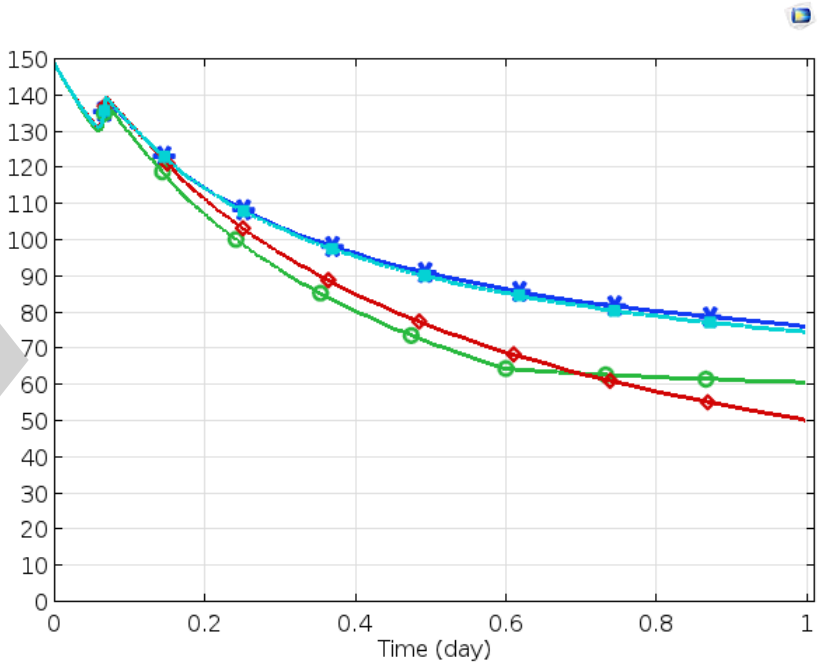
Nitrification



☞ Maximizing aerobic condition improves nitrification process

BATCH MODE - S_{NH} AND S_A DOSING





☞ Recycling only S_{NH} and S_F compounds will not beneficial for the treatment

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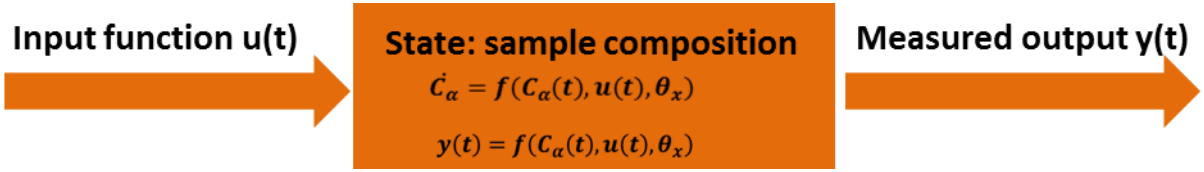
TAKE HOME MESSAGE



- The best option can be obtained when dosing maximum O_2 into the system.
- Dosing additionally S_{NH}, S_F in the condition of adequateness of O_2 will not improve the system performance.
- Further development of 1D model incorporating the electrochemical performance of the system would be very valuable in the studied field.

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THANK YOU

FOR YOUR

ATTENTION ¡