

Algae-Aerobic Granular Sludge (AAGS) for wastewater treatment: granule stability, pollutants removal performance and biodiesel potential

Rustiana Yuliasni¹, Yob Ihadjadene², Khongorzul Mungunkhuyag¹, Juliane Steingroewer¹, Thomas Walther¹ and Felix Krujatz^{2,3*}

¹Institute of Natural Materials Technology, Dresden University of Technology, 01069 Dresden, Germany; rustiana.yuliasni@mailbox.tu-dresden.de

²Professorship Automatic Control & System Dynamics, Chemnitz University of Technology, 09126 Chemnitz, Germany; felix.krujatz@etit.tu-chemnitz.de

³ biotopa gGmbH—Center for Applied Aquaculture & Bioeconomy, 01454 Radeberg, Germany

*Correspondence: felix.krujatz@etit.tu-chemnitz.de

Supplementary Material:

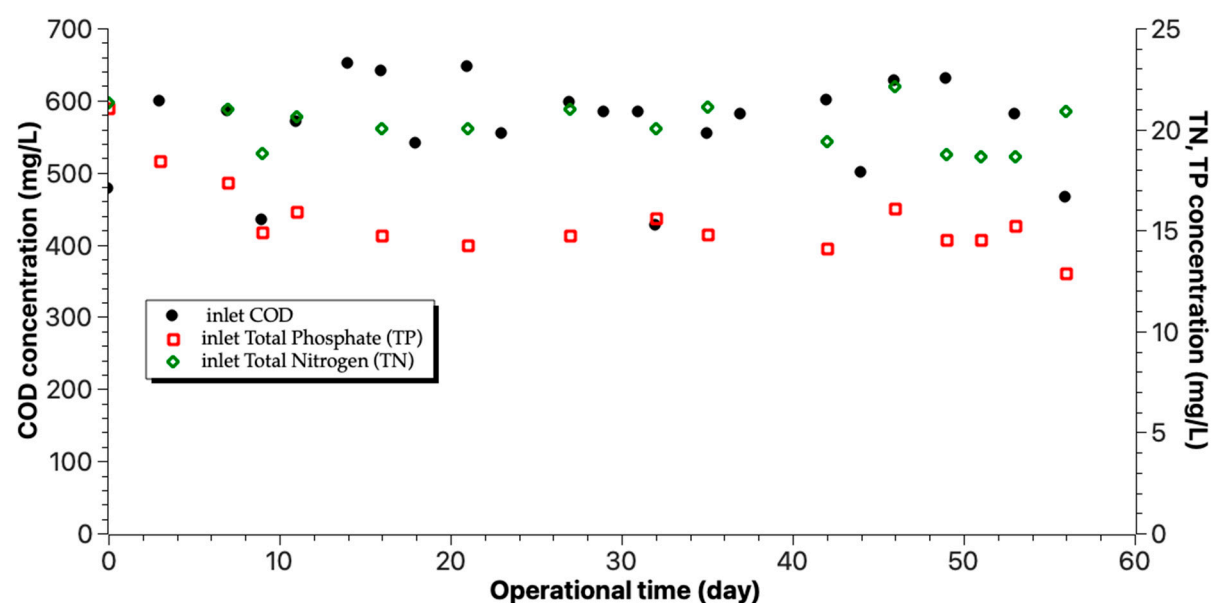


Figure S1. COD, Total Nitrogen (TN), Total phosphate (TP) inlet concentration during experiment

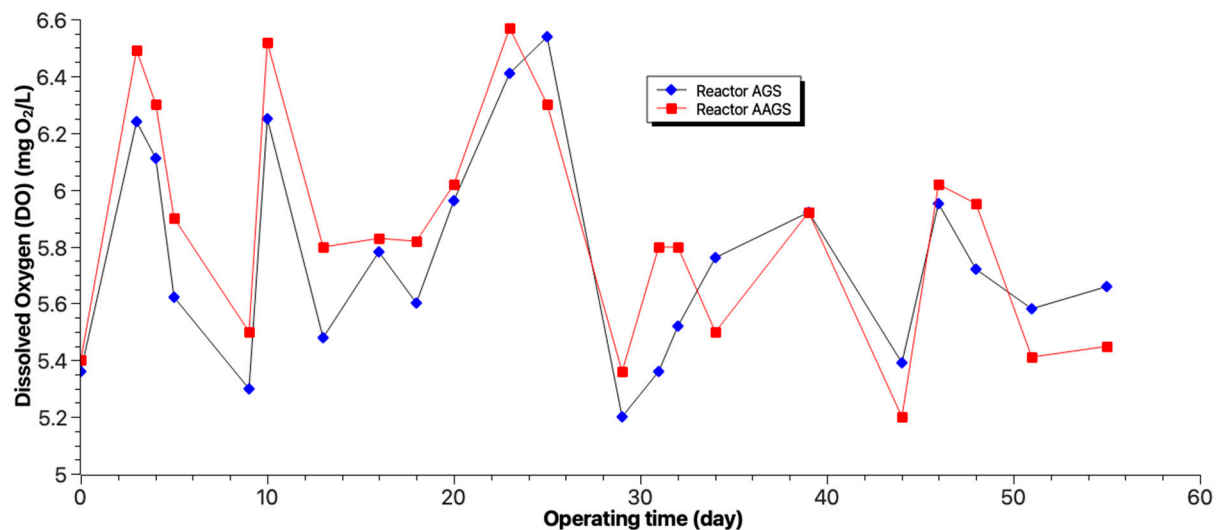


Figure S2. Dissolved Oxygen (DO) in Reactor AGS and AAGS during the experiment

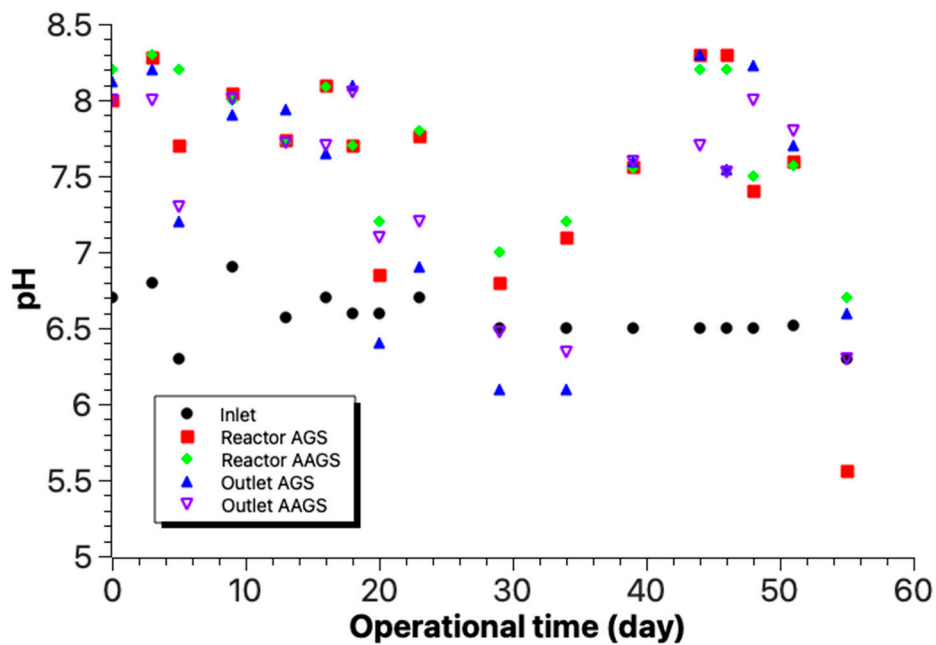


Figure S3. pH in the inlet, inside the reactors and outlet of the reactors of AGS and AAGS during the experiment

Text S1. Statistic test result:

= COD =

n=23

AGS:

mean=140, sd=62

Shapiro-Wilk: W=0.91442, p=0.05065

cannot discard hypothesis it is normal distributed

AAGS:

mean=115.8, sd=30.5

Shapiro-Wilk: W=0.9621, p=0.5072

cannot discard hypothesis it is normal distributed

Welch Two Sample t-test:

t(32.056)=1.6798, p=0.1027, conf-int: (-5.143077, 53.546555)

cannot discard hypothesis mean is equal

Exact two-sample Kolmogorov-Smirnov test

D=0.34783, p=0.1062

assume equal distribution

= Nitrogen =

n=23

AGS:

mean=6.07, sd=6.75

Shapiro-Wilk: W=0.80226, p=0.0004166

H0 should be discarded -> assume no normal distribution

AAGS:

mean=0.84, sd=1.56

Shapiro-Wilk: W=0.57856, p=5.295e-07 < 0.001

H0 should be discarded -> assume no normal distribution

Wilcoxon rank sum test (Mann-Whitney-U):

W=406, p=0.001949

discard same distribution

Exact two-sample Kolmogorov-Smirnov test

D=0.56522, p=0.0009902

assume not identically distributed

= Phosphate =

n=21

AGS:

mean=10.66, sd=1.67

AAGS:

mean=6.45, sd=1.02

Welch Two sample t-test

t(33.018)=9.8597, p=2.29e-11

-> true difference in means not the same

kolmogorov: D=0.90476, p=3.199e-09

= MLSS =

AGS

shapiro-wilk: $W=0.89907$, $p=0.2466$

AAGS

shapiro-wilk: $W=0.92114$, $p=0.4018$

welch:

$t=-1.8074$, $df=15.587$, $p=0.09004$

kolmogorov $D=0.44444$, $p=0.3241$

-> similar distribution

= MLVSS =

AGS

shapiro-wilk: $W=0.92043$, $p=0.3958$

AAGS

shapiro-wilk: $W=0.89355$, $p=0.2169$

welch:

$t=1.7539$, $df=15.777$, $p=0.09884$

kolmogorov: $D=0.44444$, $p=0.3517$

-> similar distribution