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## Memory

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# Modeling bioprocesses and membrane fouling in membrane bioreactor (MBR): calibrated and validated model using AQUASIM and MATLAB®

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## Abstract

This paper presents an activated sludge model suitable for modeling membrane bioreactors (MBRs) for wastewater treatment. The model, later referred to as combined SMP production ASM1-based model (SMP-ASM1), extends Activated Sludge Model No. 1 (ASM1) with bio kinetics of bacterial biopolymers: soluble microbial products (SMP) (UAP and BAP). The biopolymer kinetics in SMP-ASM1 are, in their majority, borrowed from theory although, as shall be explained in the study, SMP-ASM1 was calibrated on published experimental results from continuous submerged membrane bioreactor pilot plant experiments (data was obtained from the experiment of Dr. benaliouche hana et al. and proved to be in good agreement with measurements. A modified (ASM1-SMP) is calibrated using two software AQUASSOM and MATLAB. The model obtained was then used to predict SMP production (UAP and BAP) in an activated sludge system under various operating conditions (SRT, DCO/N).

Keywords: ASM1-SMP, BAP, membrane bioreactor (MBR), UAP, COD removal soluble microbial products (SMP) , Activated Sludge Model No. 1 (ASM1).

## Résumé

Cet article présente un modèle de boues activées adapté à la modélisation des bioréacteurs à membrane (MBR) pour le traitement des eaux usées. Le modèle, plus tard appelé modèle basé sur ASM1 de production combinée de SMP (SMP-ASM1), étend le modèle de boues activées n° 1 (ASM1) avec la bio cinétique des bio polymères bactériens : produits microbiens solubles (SMP) (UAP et BAP). La cinétique des bio polymères dans SMP-ASM1 est, dans sa majorité, empruntée à la théorie bien que, comme cela sera expliqué dans l'étude, SMP-ASM1 ait été calibré sur des résultats expérimentaux publiés d'expériences en usine pilote de bioréacteur à membrane submergée continue (les données ont été obtenues à partir de l'expérience du Dr **BENALIOUCHE HANA** et al. et s'est avéré en bon accord avec les mesures. Un modèle modifié (ASM1-SMP) est calibré à l'aide de deux logiciels AQUASIM et MATLAB. Le modèle obtenu a ensuite été utilisé pour prédire la production de SMP (UAP et BAP) dans un système à boues activées dans différentes conditions de fonctionnement (SRT, DCO/N).

Mots clés : ASM1-SMP, BAP, bioréacteur à membrane (BRM), UAP, élimination de la DCO Produits microbiens solubles (SMP), boues activées modèle n° 1 (ASM1).

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