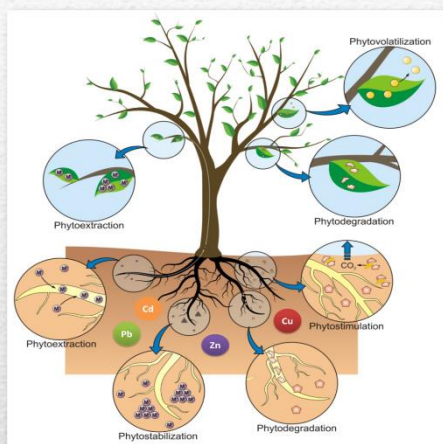


PRÉTRAITEMENT PAR EXPLOSION À LA VAPEUR ET CONVERSION EN BIOÉTHANOL DE SAULE (*SALIX VIMINALIS*) ISSU DE PHYTOREMÉDIATION

La phytoremédiation consiste en dépollution des sols ou la stabilisation des polluants par l'utilisation des plantes ligneuses ou annuelles



(Favas et al, 2014)

Sols restaurés

Production importante de biomasses contaminées



Devenir de cette biomasse polluée ?

Temps de résidence des métaux lourds dans le sol : **1000 ans !**

Alternative pour la forte demande en matière première



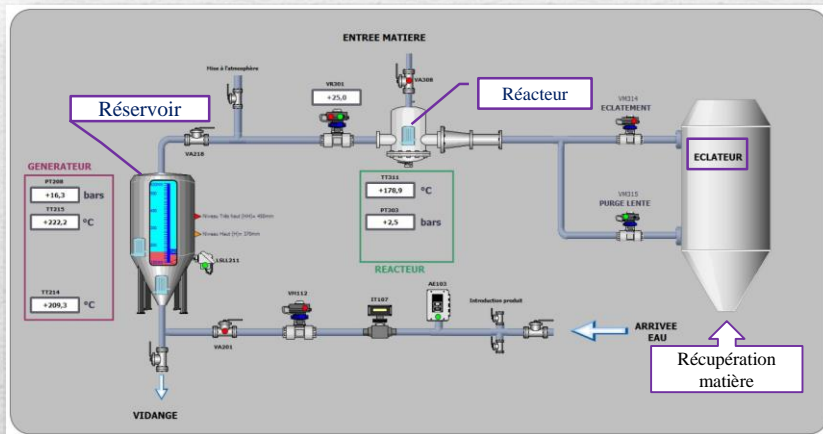
Eviter le transfert des polluants dans l'écosystème

Valorisation en industrie papetière ou bioraffinerie

Récolte de biomasse contaminée



EXPLOSION VAPEUR



Biocarburant

Fibres

Polymères

APPROCHE BIORAFFINERIE

PRÉTRAITEMENT

VALORISATION

BIOETHANOL PRODUCTION FROM CONTAMINATED WILLOW PRETREATED BY STEAM EXPLOSION PROCESS

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INTRODUCTION

- The management of polluted soils is a worldwide issue;
- Phytoremediation technologies are a set of sustainable options for alleviating heavy-metals pollutions;
- These technologies produce high quantities of contaminated biomass;
- The objective of our study is to valorize this biomass using a biorefinery approach.

LORVER PROJECT

The aim of the LORVER project is to create a non-food biomass production chain by upgrading degraded sites and industrial by-products.

RESEARCH QUESTIONS

- What is the fate of the heavy metals during the steam explosion treatment of a contaminated wood?
- Is it possible to convert heavy metals contaminated biomass into bioethanol?
- What about the management of the heavy metals for avoiding their dissemination into the ecosystem?

Steam Explosion Process

- Steam explosion process is one of the most valuable pretreatment for wood fractionation
- The different conditions applied are summarized in the table
- Contaminated willow provided from polluted sites was used in this study

Run	Temp (°C)	Time (min)	Pressure (bars)
1	180	10	2.5
2	180	20	2.5
3	180	30	2.5
4	180	40	2.5
5	180	50	2.5
6	180	60	2.5
7	180	70	2.5
8	180	80	2.5
9	180	90	2.5
10	180	100	2.5

Metals content

- After pretreatment a solid and a liquid fraction were recovered
- To evaluate the pretreatment efficiency and the distribution of the metals in both fractions, mineralization and ICP-AES analysis have been performed

Enzymatic hydrolysis

- Solid residue recovered after steam explosion treatment was hydrolyzed by an enzymatic method
- Cellulases from *Trichoderma reesei* were used to convert cellulose into glucose in sodium acetate buffer
- Periodicals sampling were carried out to follow the production of glucose: by HPAEC-PAD

Ethanol production

- Glucose rich fraction recovered after enzymatic hydrolysis was used in this step
- Saccharomyces cerevisiae* yeasts are added in the mixture and incubated during 48h
- Kinetics of ethanol production is followed by sampling
- The quantification of the ethanol produced is realized by HPLC method

Purification

- Metals-rich fraction (liquid phase) obtained after steam explosion pretreatment was purified
- Modified cellulose fibers (KFP-Na) was used
- The treatment was realized at the room temperature
- Metals content in the liquid fraction was determined by ICP-AES after mineralization

ACKNOWLEDGMENTS

REFERENCES

