Ru-SUPPORTED ON MESOPOROUS SILICA AS ACTIVE CATALYST FOR THE HYDROLYSIS OF THE HEMICELLULOSIC FRACTION OF WHEAT BRAN

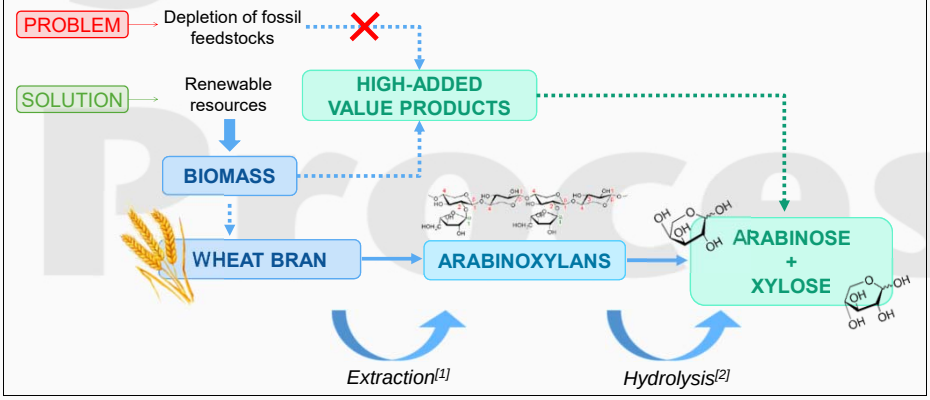
Nuria Sánchez-Bastardo*, Esther Alonso

High Pressure Processes Group – Dep. Chemical Engineering & Environmental Technology
University of Valladolid, C/Dr. Mergelina s/n E-47011 – Valladolid, SPAIN. *contact e-mail: nuriasanchez2791@gmail.com

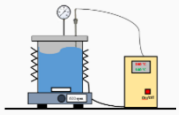
10th World Congress of Chemical Engineering. Barcelona (Spain). October 1-5, 2017

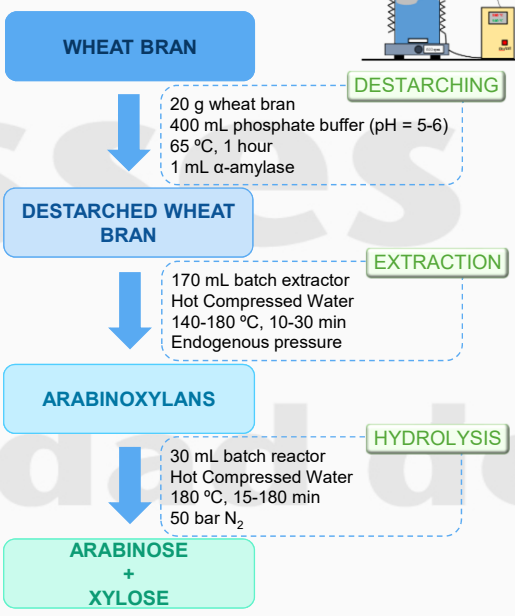
1 Introduction

The current depletion of fossil resources is forcing society to look for renewable alternatives for energy and chemicals production. In this context, biomass is considered a sustainable and renewable feedstock suitable for the production of high-added value products (C5 sugars in this work). The production of C5 sugars (arabinose and xylose) from wheat bran can be divided into two main steps: 1) Extraction of arabinoxylans, mainly as oligomers and 2) Hydrolysis of arabinoxylans into monomers. In order to overcome the drawbacks of conventional methods with acids or enzymes, both steps have been studied by using Ru-supported catalysts.



2 Experimental



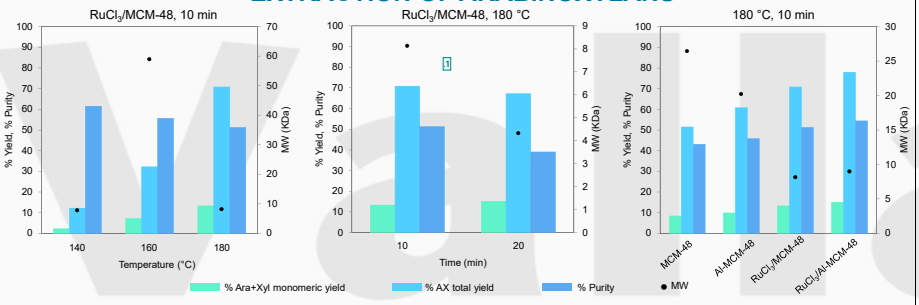


3 Results

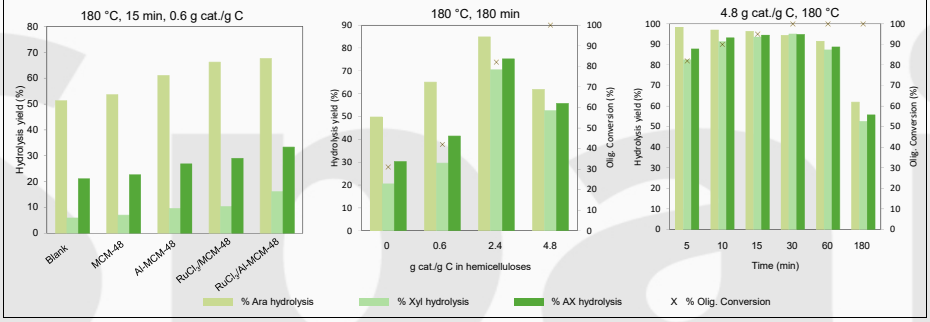
CATALYST CHARACTERIZATION

Catalyst	Ru (%)	S_{BET} ($m^2 \cdot g^{-1}$)	V_{pore} ($cm^3 \cdot g^{-1}$)	D_{pore} (nm)	Acidity (mEq H^+/g cat)
MCM-48	-	1298	0.87	2.2	0.293
Al-MCM-48	-	1352	0.81	2.5	0.598
$RuCl_3$/MCM-48	4	1032	0.63	2.2	0.738
$RuCl_3$/Al-MCM-48	4	1017	0.63	2.7	1.130

EXTRACTION OF ARABINOXYLANS

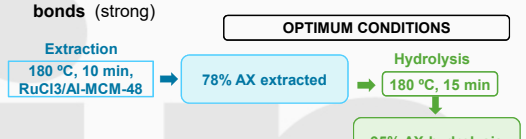


HYDROLYSIS OF ARABINOXYLANS



4 Conclusions

- **Extraction** + **Hydrolysis** of arabinoxylans have been studied using $RuCl_3$ catalysts over different mesoporous silica supports
- **Acidity** of the catalyst is a key paramerter for these processes:
  ↑ Acidity, ↑ Yield
- **Ru^{+3}** has demonstrated to be active, as it is a **moderate Lewis acid**
- **Arabinose** is always **faster released than xylose:**
  - **Arabinose** belongs to **side chains** and it is linked by **α-glycosidic bonds** (weak)
  - **Xylose** belongs to the **backbone** and it is linked by **β -glycosidic bonds** (strong)



REFERENCES

[1] Sánchez-Bastardo, N., Romero, A., Alonso, E., 2017. Carbohydrate Polymers. 160, 143-152.

[2] Sánchez-Bastardo, N., Alonso, E., 2017. Bioresource Technology. 238, 379-388.

ACKNOWLEDGEMENTS

BIOFRAHYNERY
CTQ2015-64892-R (MINECO/FEDER)
FPU14/00812