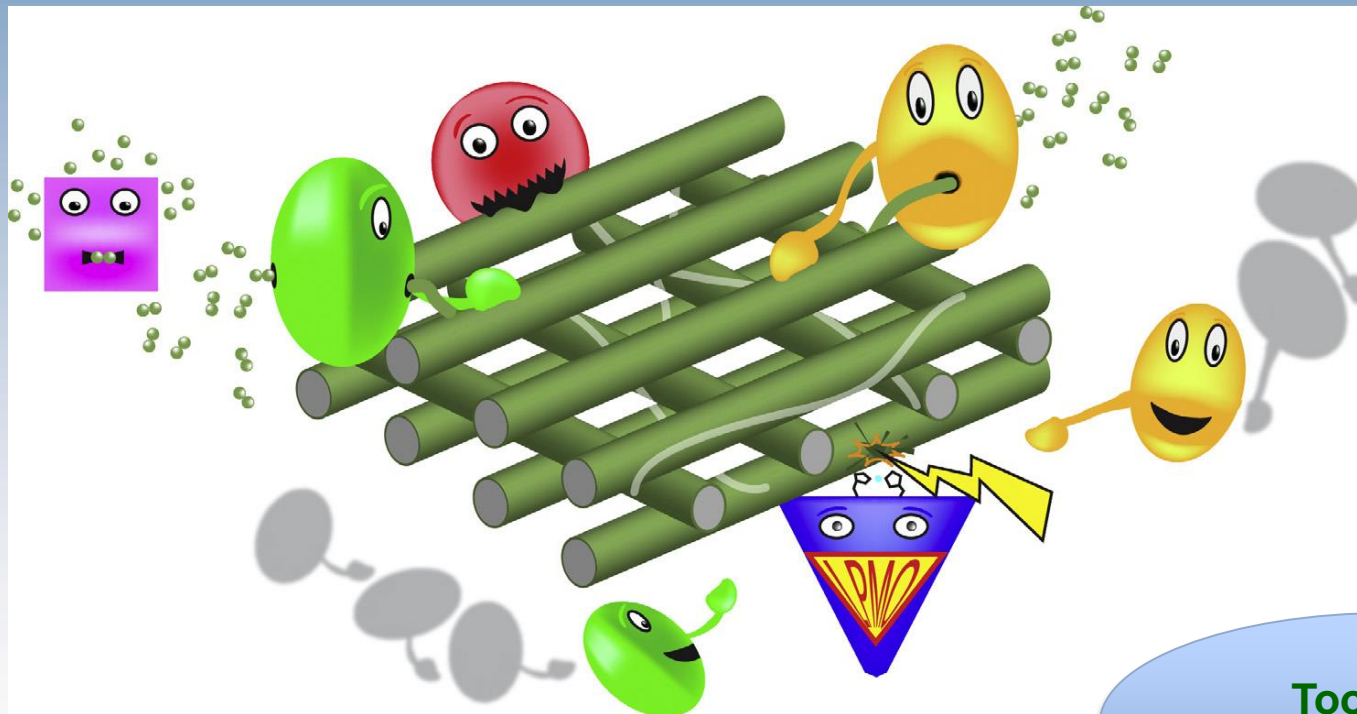



# Lytic Polysaccharide MonoOxygenases and their role in De-polymerisation of Lignocellulose


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



# The latest recruitment in the 'cellulose-eating-party'..



 Endo-cellulases

 Exo-cellulases I

 b-glucosidases

 Exo-cellulases II

**Tools of a  
cellulolytic fungi!**

## LPMOs; one interesting class of enzymes.

**Saccharification  
by oxidation<sup>1</sup>**

*Electric (!) driven<sup>2</sup>*

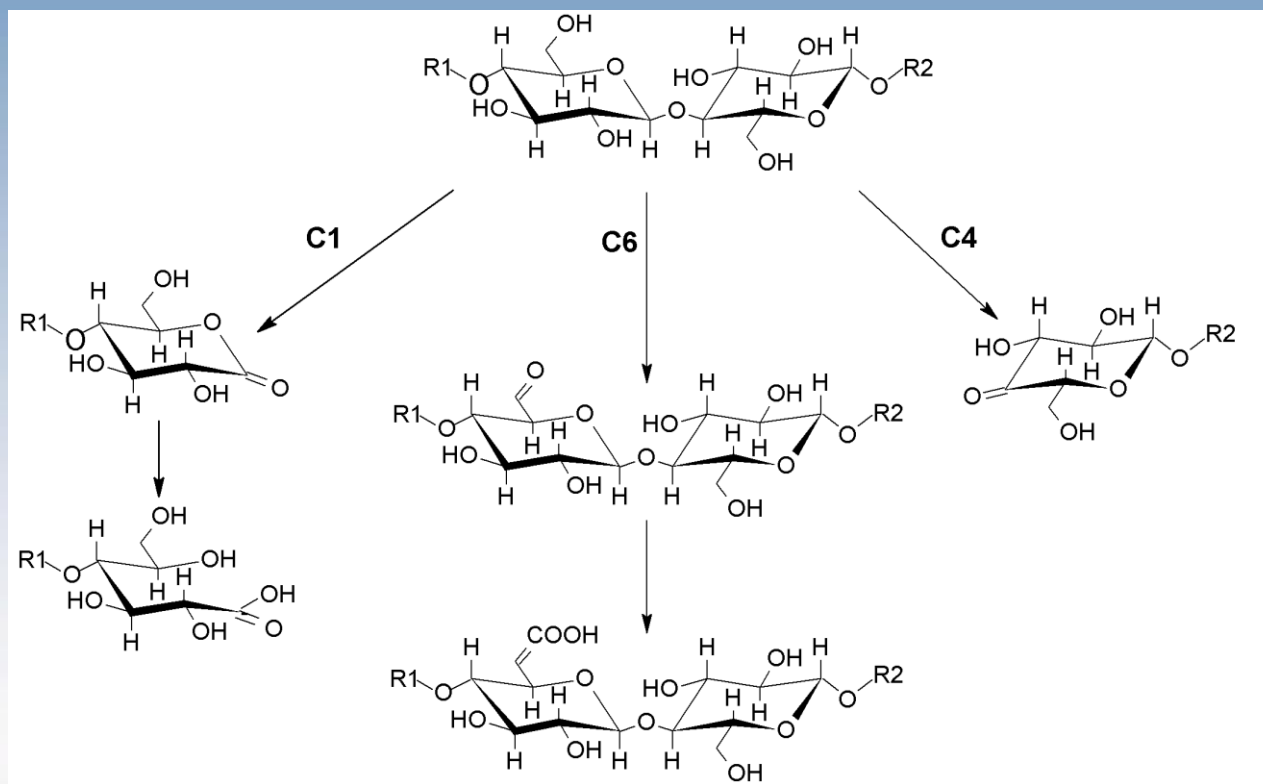
**Wood activates the  
enzyme to degrade  
it<sup>2</sup>**

*'Suffocation' in the  
absence of oxygen?<sup>3</sup>*

**The 'METAL head'<sup>3</sup>**

1. Forsberg, Zarah, et al. "Cleavage of cellulose by a CBM33 protein." *Protein Science* 20.9 (2011): 1479-1483.
2. Dimarogona, Maria, et al. "Lignin boosts the cellulase performance of a GH-61 enzyme from *Sporotrichum thermophile*." *Bioresource Technology* 110 (2012): 480-487.
3. Beeson, William T., et al. "Oxidative cleavage of cellulose by fungal copper-dependent polysaccharide monooxygenases." *Journal of the American Chemical Society* 134.2 (2011): 890-892.

# Types and products

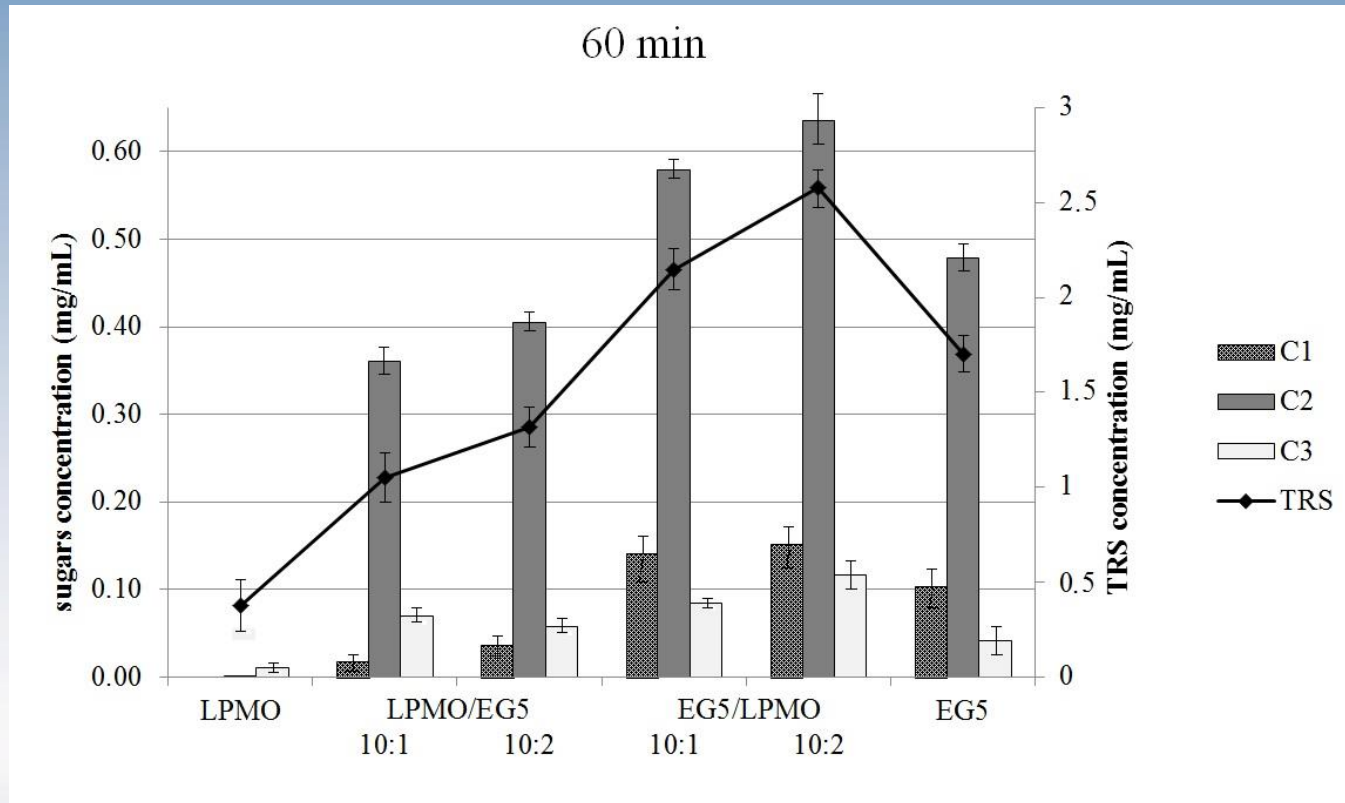


**C1** oxidation: lactones hydrolyzed to aldonic acids,

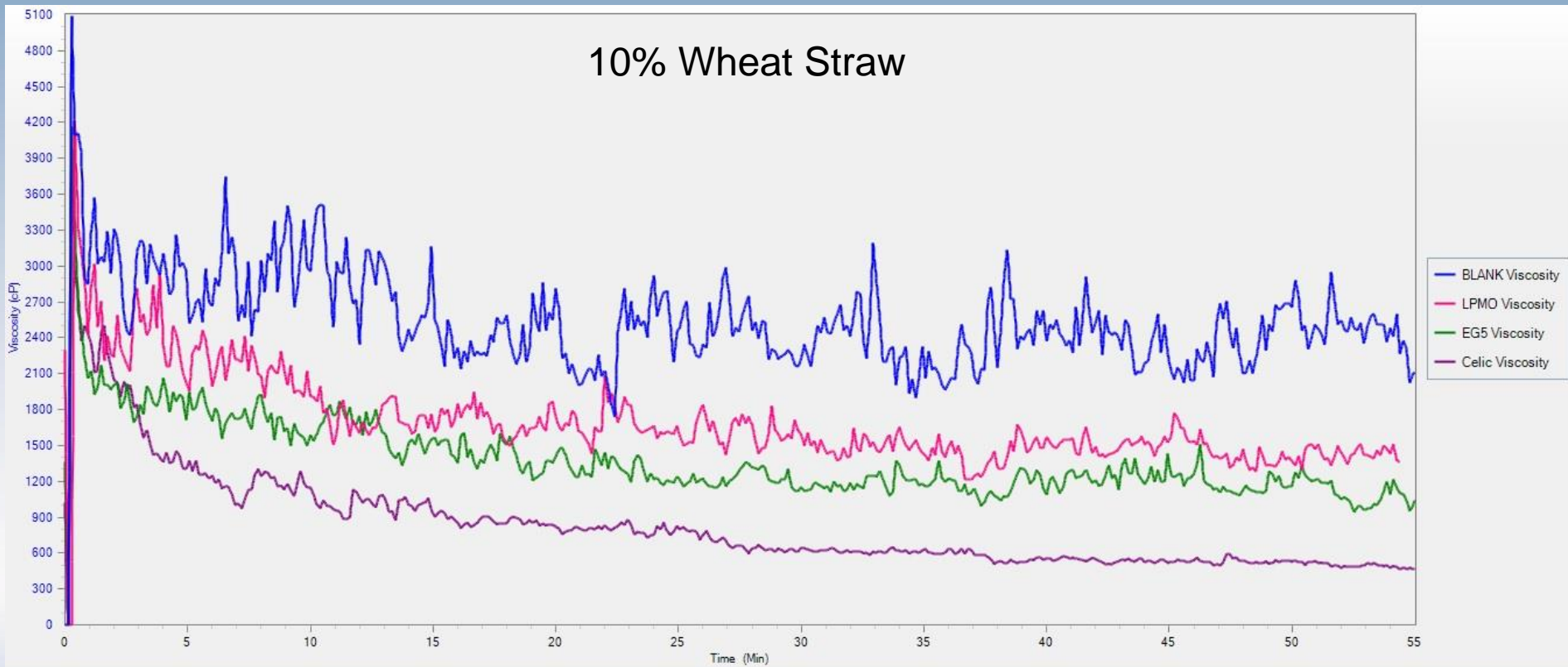
**C4** oxidation: 4-ketoaldoses

**C6** oxidation: aldehydes that can be further oxidized to the corresponding uronic acids

# Synergism



# Liquefaction of high dry-matter lignocellulose



# Role of pre-treatments

## Molecular weight of lignins from\_Birch

	Steam Explosion	OS	OS-A	OS-LF	OS-A-LF
$M_n$	1798	3041	1364	1442	983
$M_w$	13447	19714	3488	8041	1780
PDI	7,48	6,48	2,56	5,58	1,81

## Reduction potential of lignins\_Birch

	Steam explosion	OS	OS-A	OS-LF	OS-A-LF
$E_o'$	0.254	0.263	0.261	0.258	0.386
$k_s^{het}$	0.107	0.095	0.086	0.059	0.497
arom -OH	1.46	0.97	1.58	1.69	3.25

## To conclude..

- Best known for synergism with other cellulases
- From *Celluclast* to *Cellic® CTec2*
- Importance of pretreatment in LPMO action
- Targeted oxidation of cellulose