



Center for Applied
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Tin Beta Zeolite for Regioselective Baeyer-Villiger Oxidation of Lignin Model Compounds

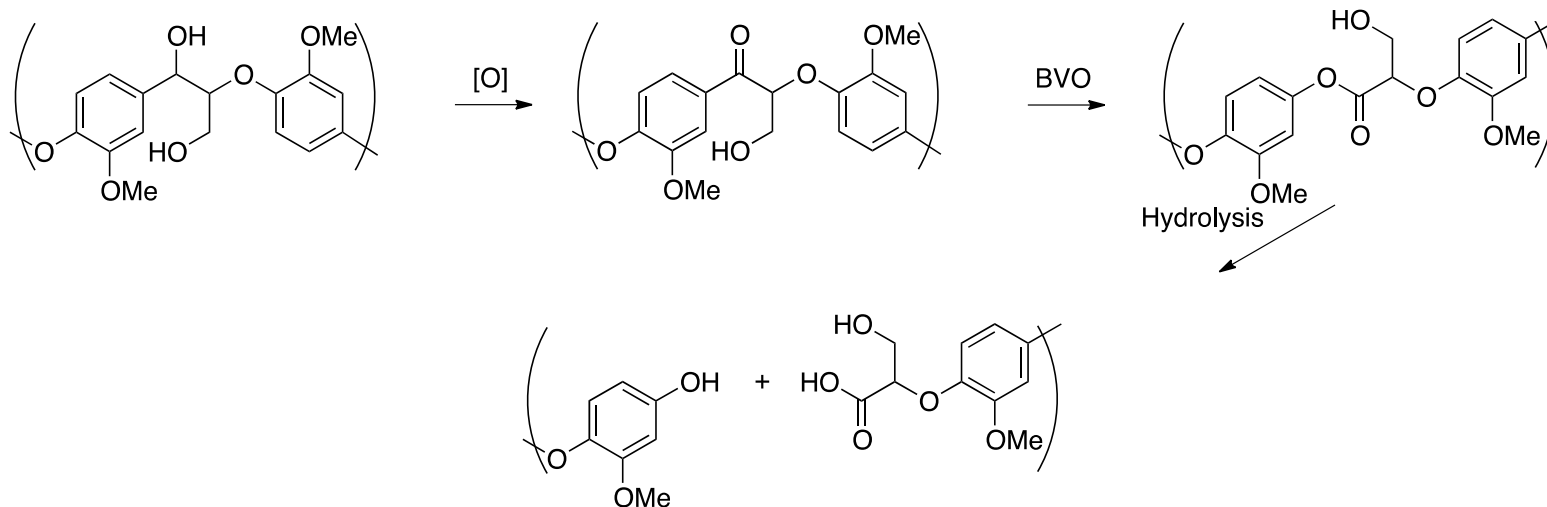
John Jennings

Frontiers in Biorefining
November 8-11, 2016



 University of
Kentucky[®]

Depolymerization Strategy



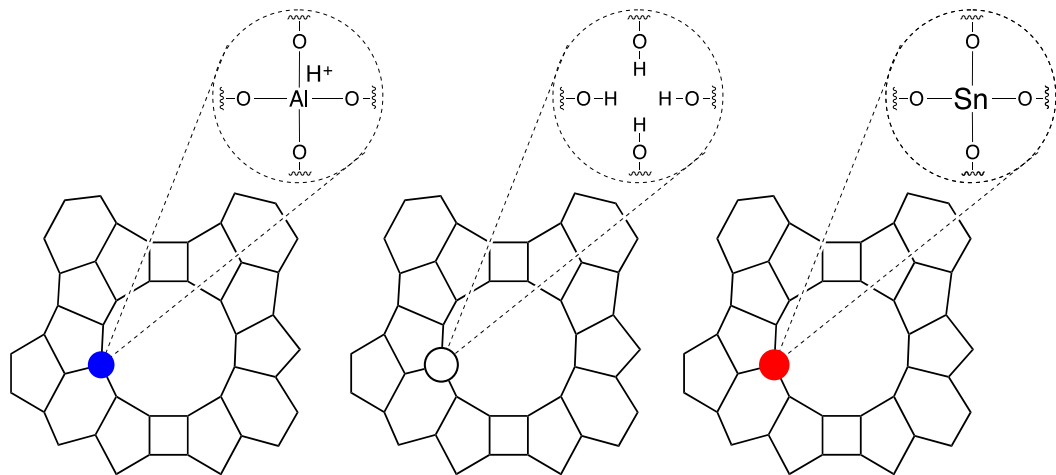
Step 1: Benzylic Oxidation¹⁻⁴

Step 2: Baeyer-Villiger Oxidation (BVO)

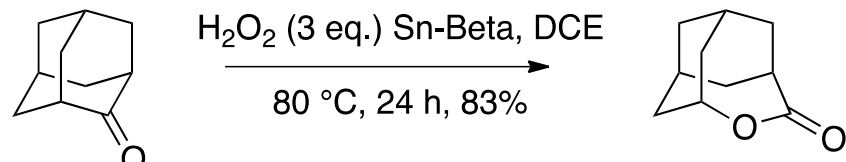
Step 3: Ester Hydrolysis

- Typical BVO uses peroxy acids and produce 1 eq. of carboxylic acid.
- Can more environmentally friendly oxidants (i.e. O_2 , H_2O_2) be used?
- Can a heterogeneous system be applied?

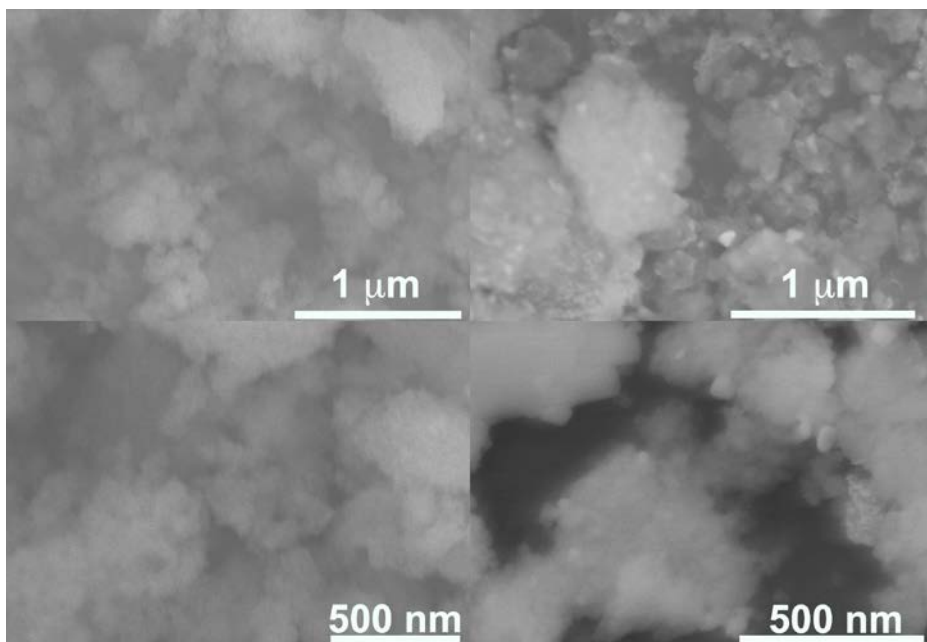
1. Rahimi, A.; Azarpira, A.; Kim, H.; Ralph, J.; Stahl, S. S., *JACS*, **2013**, 135 (17), 6415.
2. Patil, N. D.; Yao, S. G.; Meier, M. S.; Mobley, J. K.; Crocker, M., *Org. Biomol. Chem.*, **2015**, 13 (11), 3243.
3. Rahimi, A.; Ulbrich, A.; Coon, J. J.; Stahl, S. S., *Nature*, **2014**, 515 (7526), 249.
4. Lancefield, Christopher S., et al. *Angewandte Chemie* **2015**, 127 (1), 260.



Adapted from Li *et al.*⁴

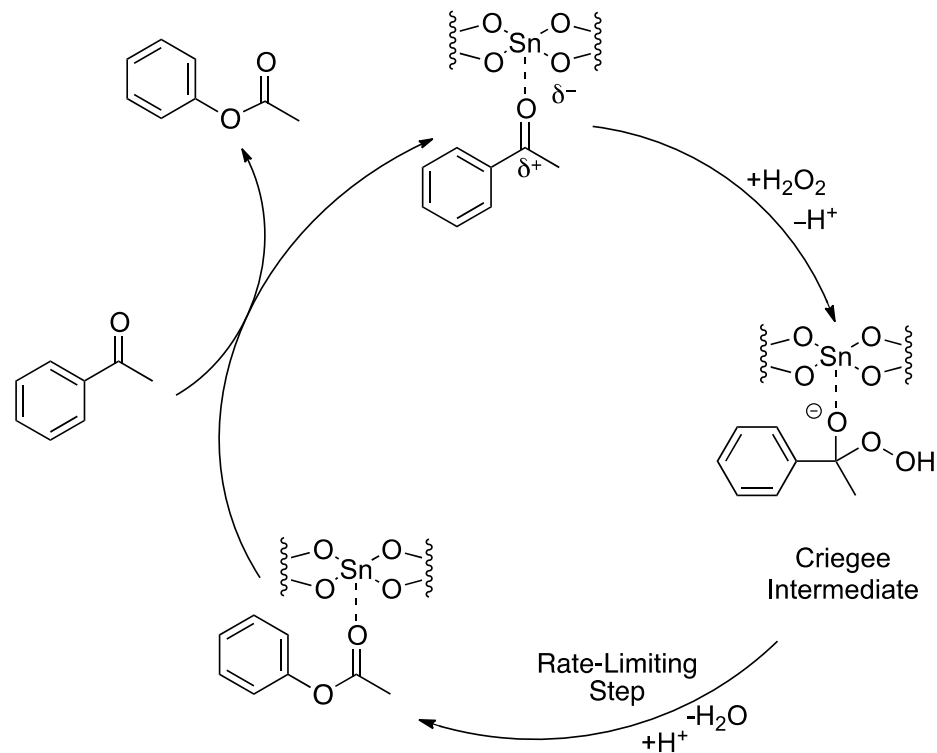


Comparable with literature results⁴
 Does this system work for aromatic compounds?



De-Al Beta Zeolite

Tin Beta Zeolite

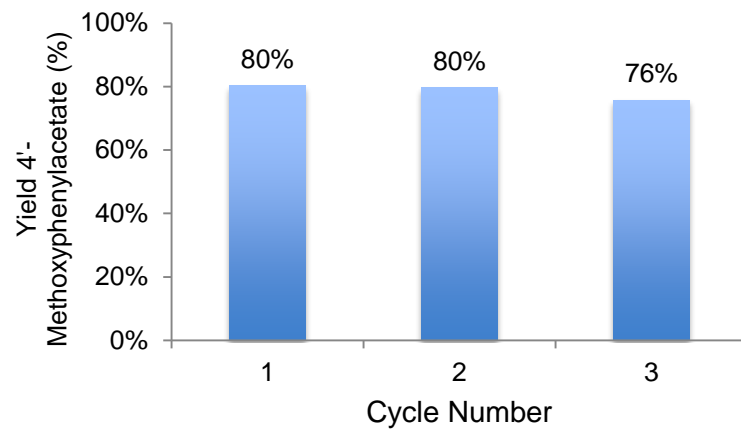
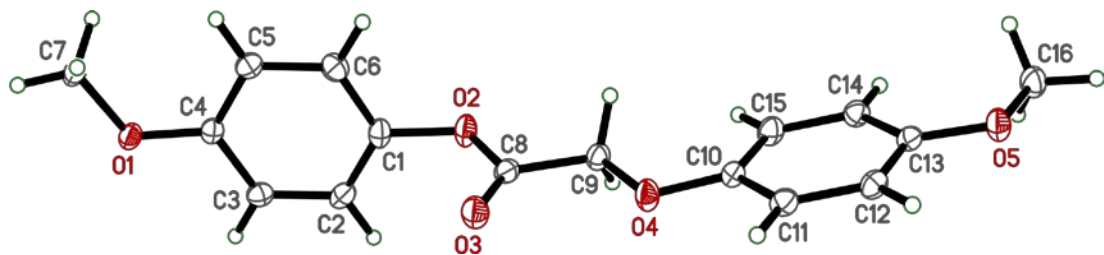
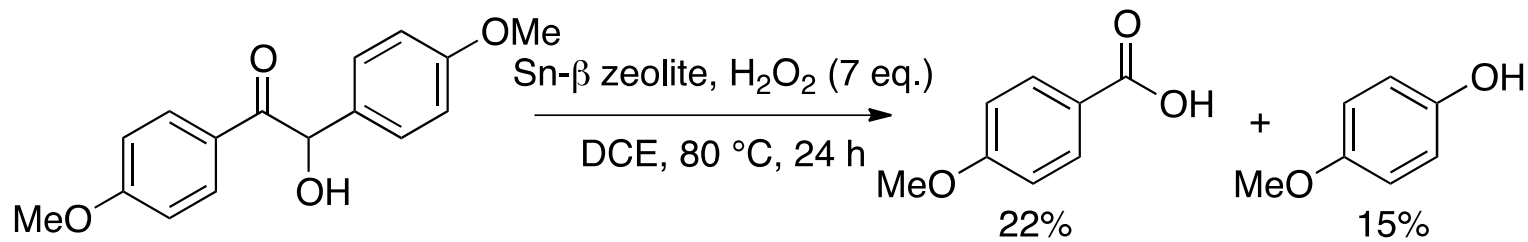
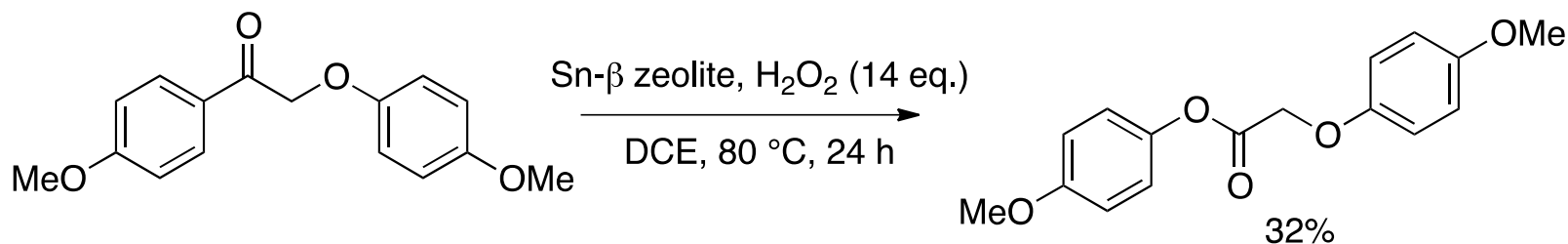
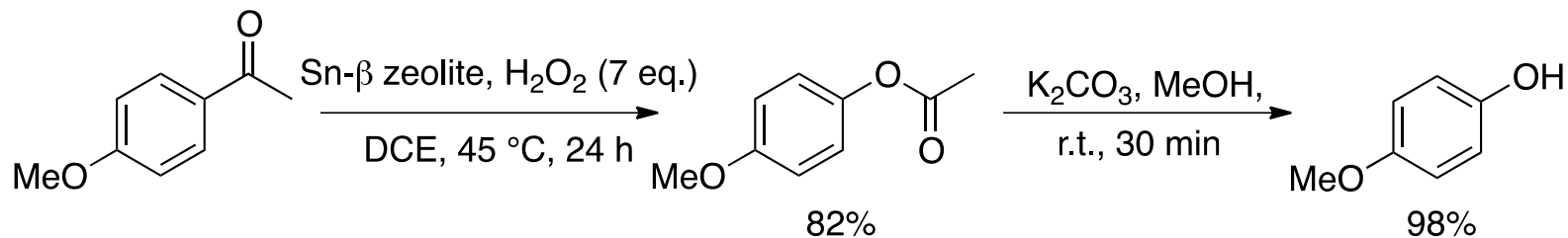


Adapted from Corma *et al.*⁵

4. Li, P.; Liu, G.; Wu, H.; Liu, Y.; Jiang, J.-g.; Wu, P., *J. of Phys. Chem. C*, **2011**, 115 (9).

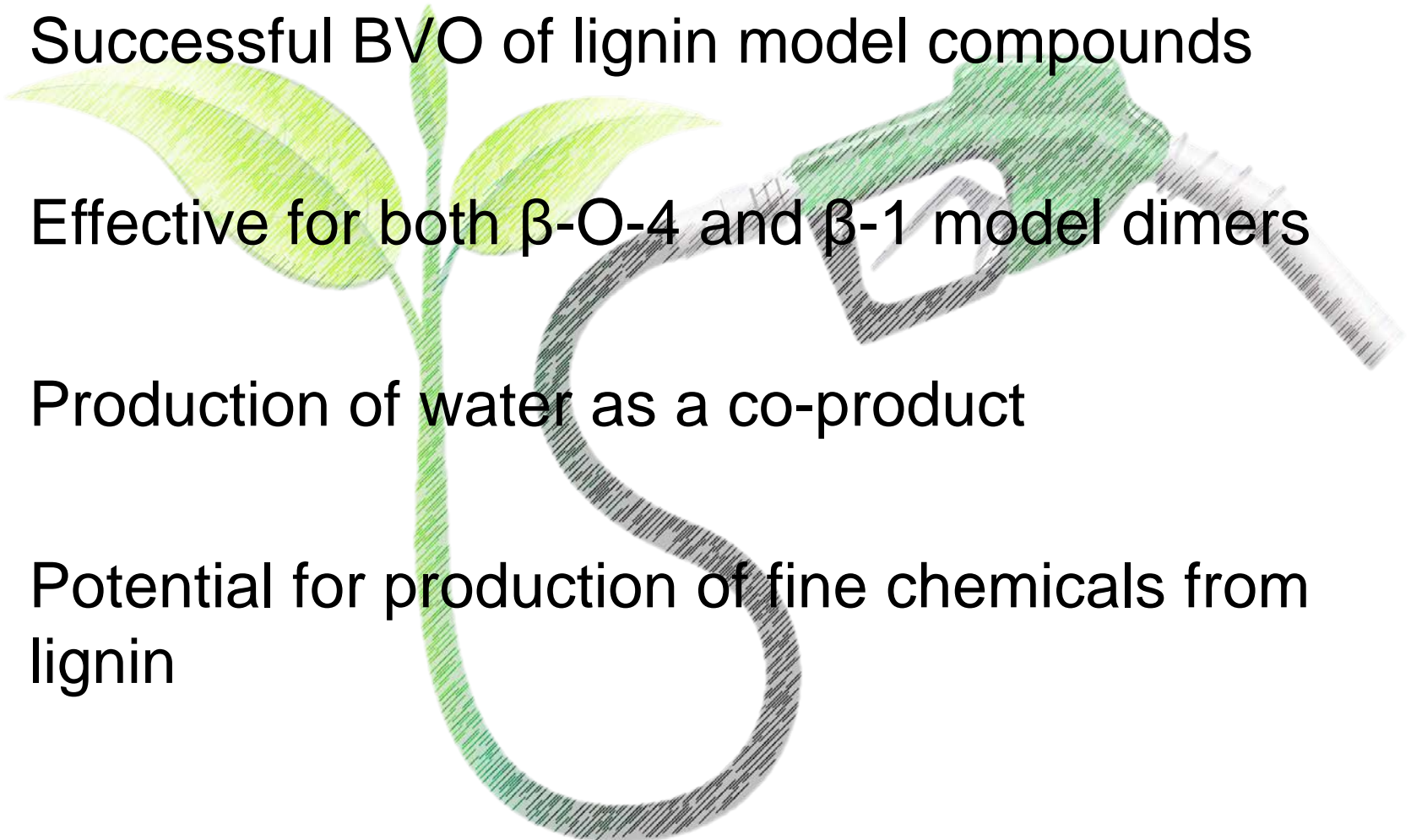
5. Corma, A.; Nemeth, L. T.; Renz, M.; Valencia, S., *Nature*, **2001**, 412 (6845), 423.

Key Results



Conclusions

- Successful BVO of lignin model compounds
- Effective for both β -O-4 and β -1 model dimers
- Production of water as a co-product
- Potential for production of fine chemicals from lignin



Acknowledgements

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