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Chemistry in the Circular Economy - Hamster Wheel or Pathway to the Future?

Replacing crude oil as the primary industrial source of carbon-based chemicals has become crucial for both environmental and resource sustainability reasons. In this scenario, wood arises as an excellent candidate, whilst depolymerization approaches have emerged as promising strategies to unlock the lignin potential as a resource in the production of high-value organic chemicals. However, many drawbacks, such as toxic solvents, expensive catalysts, high energy inputs, and poor product selectivity have represented major challenges to this task. This requires the discovery of novel electrochemically-active materials[1] and/or chemical processes based on renewable energy in order to drive sustainable technologies.
In this talk, I will highlight the importance of materials and process design on chosen examples, including catalysts for valorization of lignin[2], furfural[3], biorefinery side-streams[4], solar-driven depolymerization[5], and CO oxidation[6].

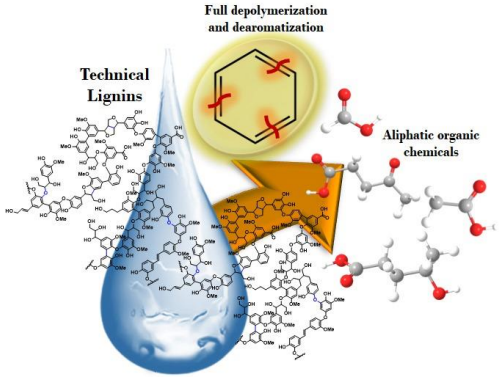

Figure 1. Organic chemicals from wood: selective depolymerization and de-aromatization of lignin *via* aqueous electrocatalysis [2].

[**1**] E.Bernhardt, A.Drichel, M.Krnel, E.Svanidze, A.Slabon, *submitted*
[**2**] L.M.Lindenbeck, B.V.M.Rodrigues, A.Slabon et al., *ChemSusChem* **2024**, accepted
[**3**] M.Wolfsgruber,R.H.Bischof, C.Paulik, A.Slabon, B.V.M.Rodrigues et al., *submitted*
[**4**] M.Wolfsgruber, C.M.Pichler, C.Paulik, B.V.M.Rodrigues, A.Slabon et al., *Catal. Sci. Technol.* **2023**, *13*, 5998
[**5**] K.Kaya, A.Atsay, H.Gunduz, A.Slabon, Y.Yagci, *Adv. Sustainable Syst.* **2023** 2300366
[**6**] A.Holm, B.Davies, A.Slabon, S.Koroidov et al. *ACS Catalysis* **2024 accepted**