

Rotas recentes para uso de lignina em biorrefinarias

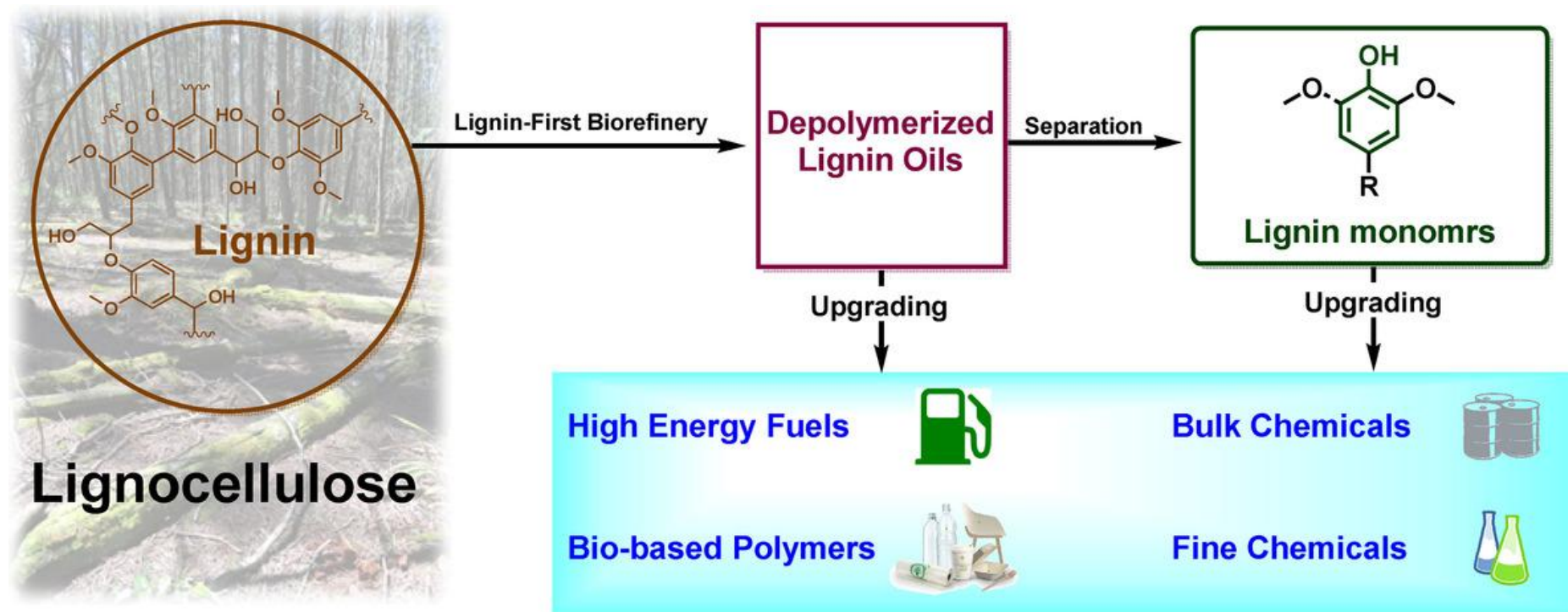
Vias em desenvolvimento, sem ainda ter atingido o mercado



Minireview | Full Access

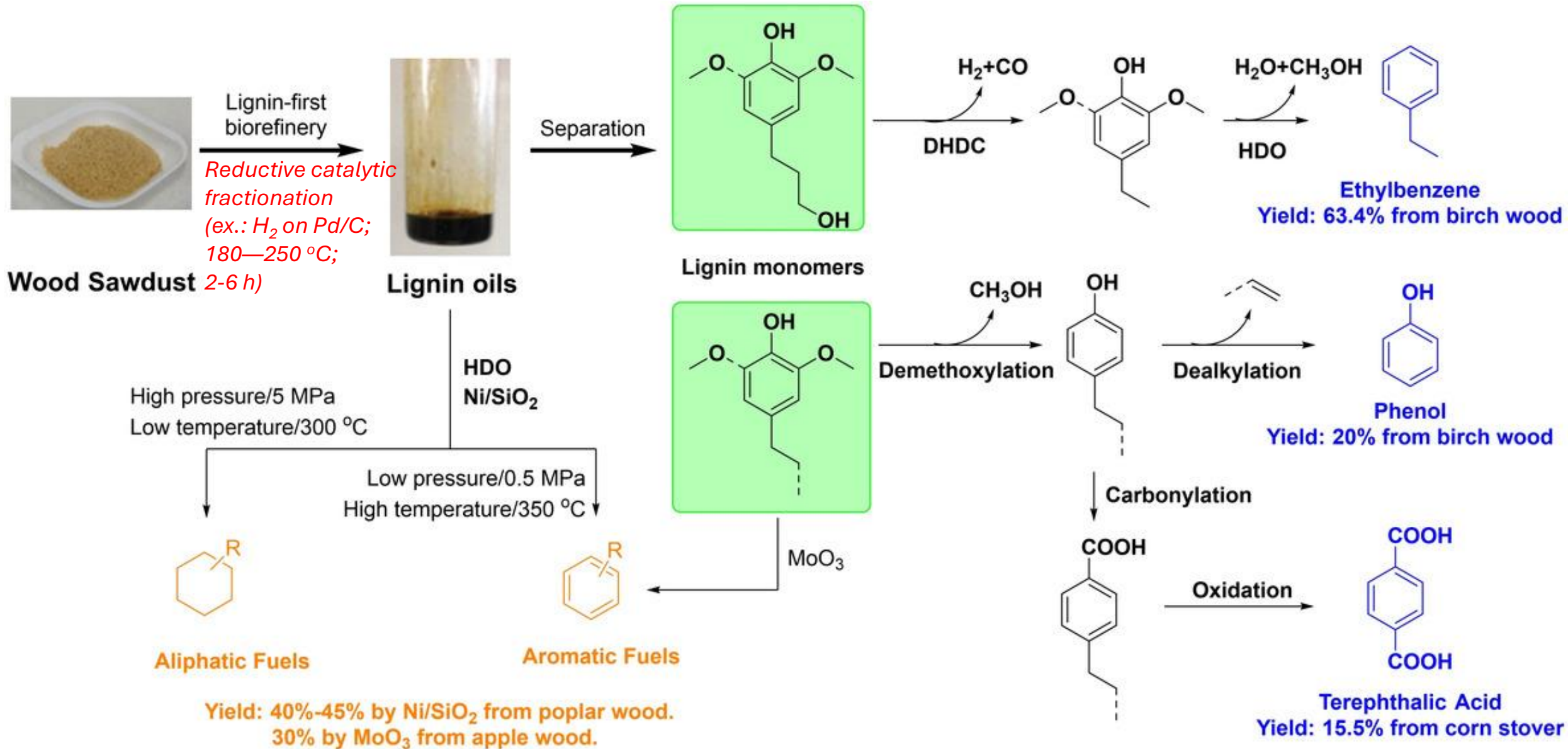
Downstream Processing Strategies for Lignin-First Biorefinery

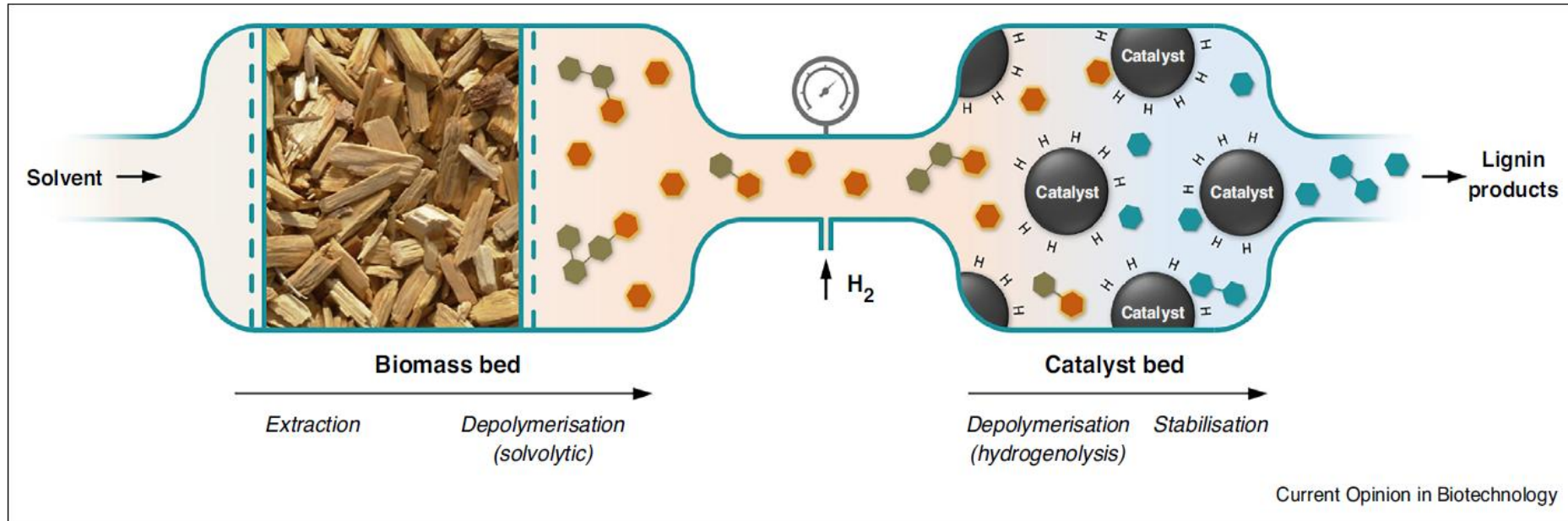
Prof. Zhuohua Sun , Dr. Jinling Cheng, Prof. Dingsheng Wang, Prof. Tong-Qi Yuan , Prof. Guoyong Song, Prof. Katalin Barta

First published: 03 August 2020 | <https://doi.org/10.1002/cssc.202001085> | Citations: 21

Transformação da lignina em óleos por redução catalítica

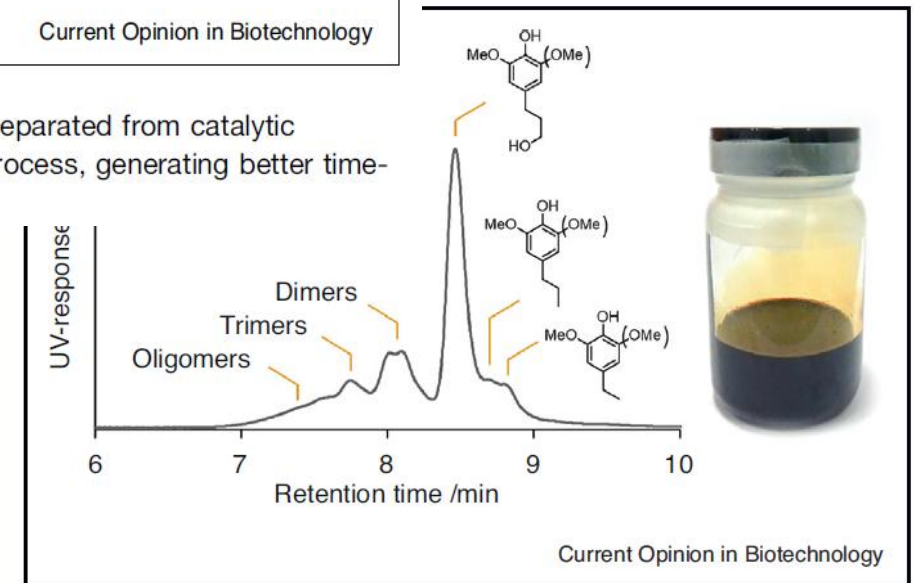
Current Opinion in Biotechnology 2019, 56:193–201





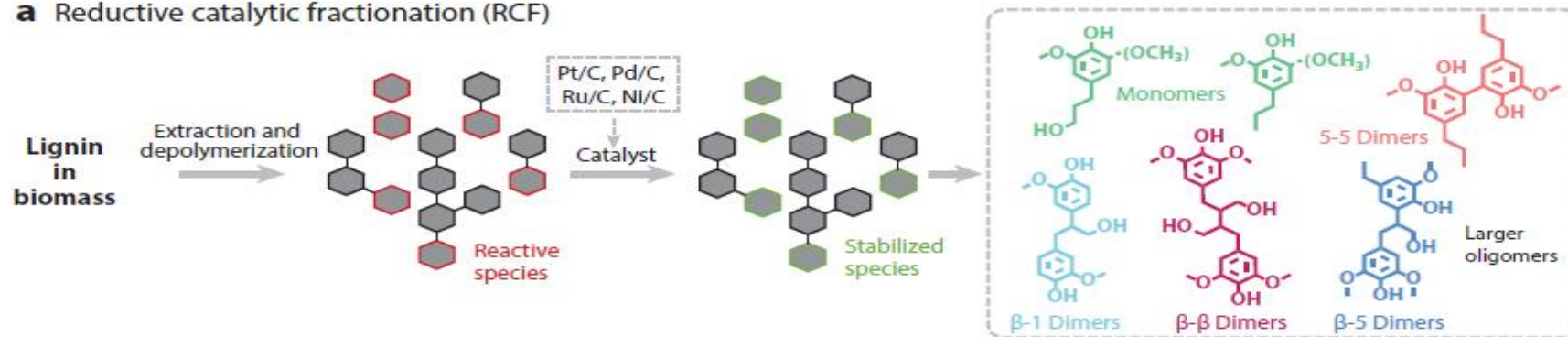
Reductive catalytic fractionation

Schematic representation of RCF in flow-through mode. Solvolytic lignin extraction-depolymerisation is physically separated from catalytic depolymerisation–stabilisation, which offers greater flexibility. In addition, flow-through RCF is a semi-continuous process, generating better time-resolved data compared to batch processes.

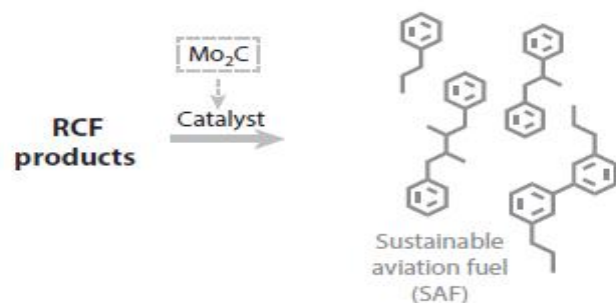


Gel permeation chromatogram of a typical RCF lignin oil (eucalyptus), with signal assignment. Roughly 50 wt% of the lignin oil comprises phenolic monomers. The other fraction comprises dimers, trimers and small oligomers. GPC chromatogram was adapted from Ref. [33].

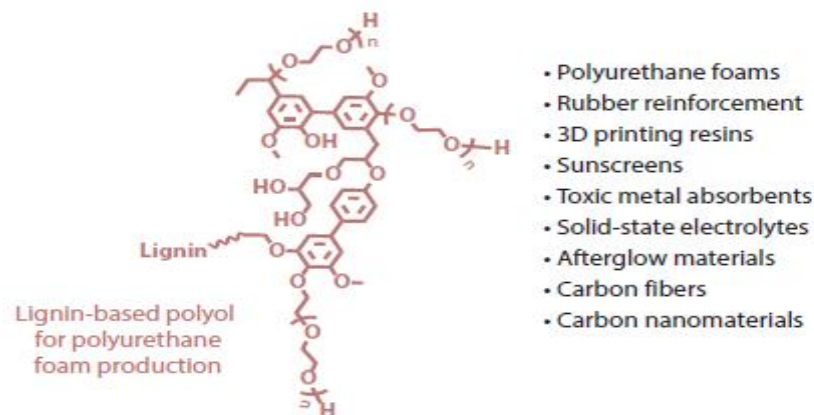
a Reductive catalytic fractionation (RCF)



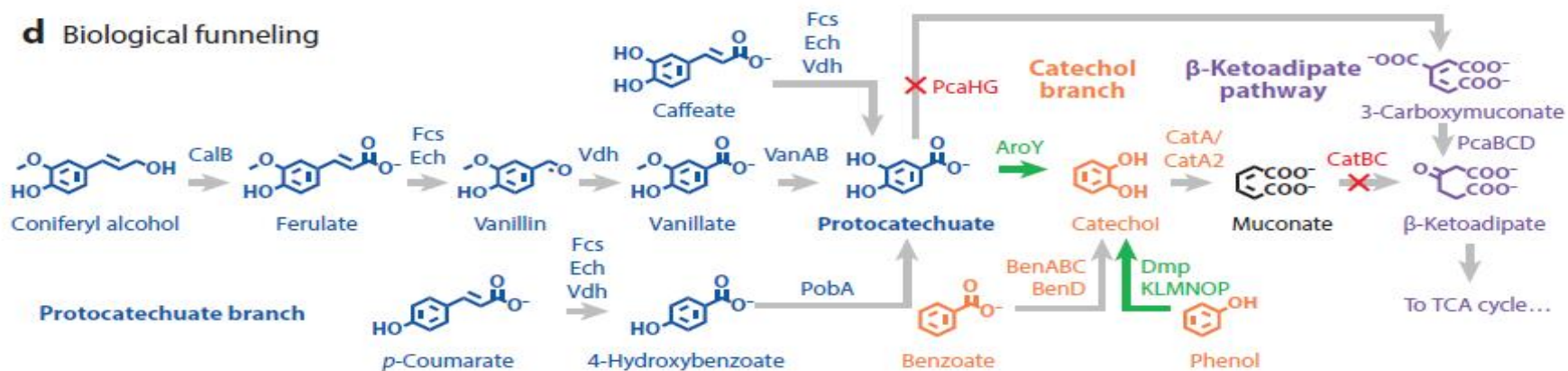
b Upgrading of RCF products to fuels



c Materials manufacture




d Biological funneling



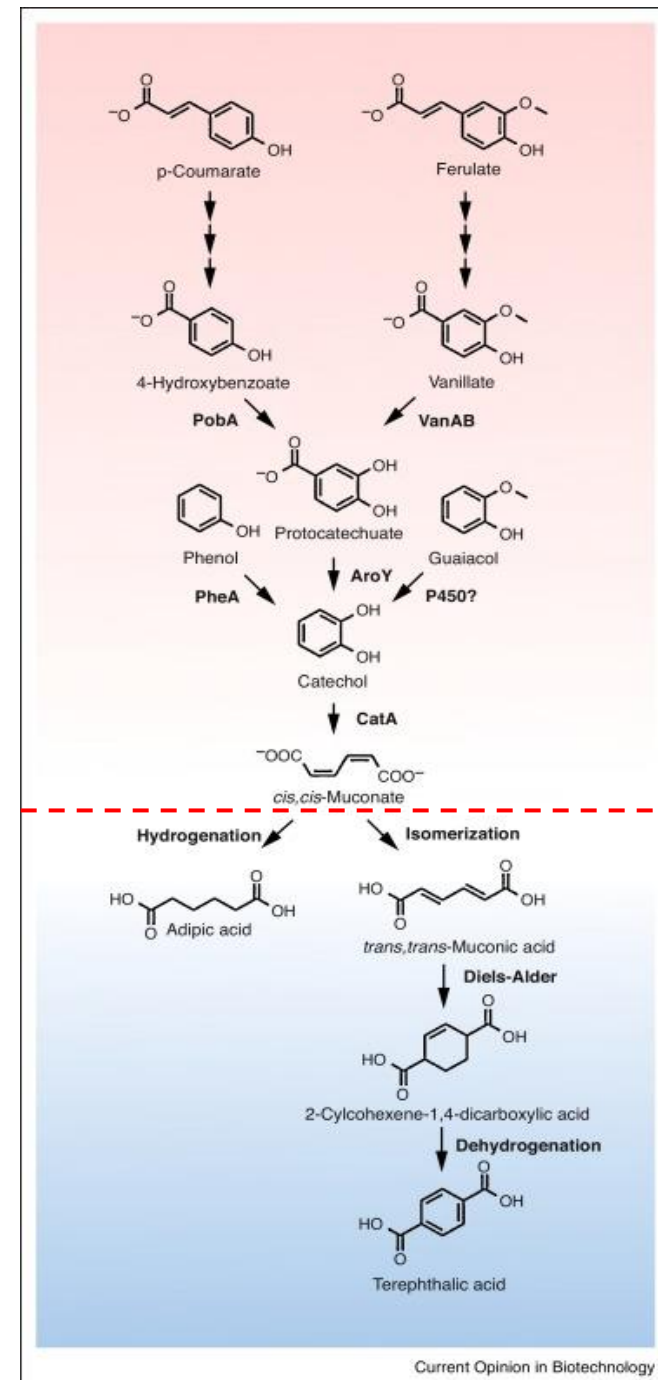
Annu. Rev. Plant Biol.
2024. 75:239–63.
<https://doi.org/10.1146/annurev-arplant-062923-022602>

Opportunities and challenges in biological lignin valorization

Gregg T Beckham , Christopher W Johnson, Eric M Karp, Davinia Salvachúa, Derek R Vardon

Microbes capable of metabolizing aromatic monomers derived from depolymerized lignin, such as p-coumarate, ferulate, 4-hydroxybenzoate, vanillate, phenol, or guaiacol, convert these molecules through ‘upper pathways’ to two central intermediates, protocatechuate and catechol.

Protocatechuate can be decarboxylated by AroY to form catechol, which is then subjected to ring-opening to form cis-cis-muconate by CatA, a catechol 1,2-dioxygenase. Subsequently, muconic acid can be chemo-catalytically converted to (a) adipic acid via hydrogenation, or (b) terephthalic acid via isomerization, Diels–Alder reaction with ethylene, and dehydrogenation.



MUCONIC ACID PRODUCTION BY ENGINEERED *P. putida* KT2440

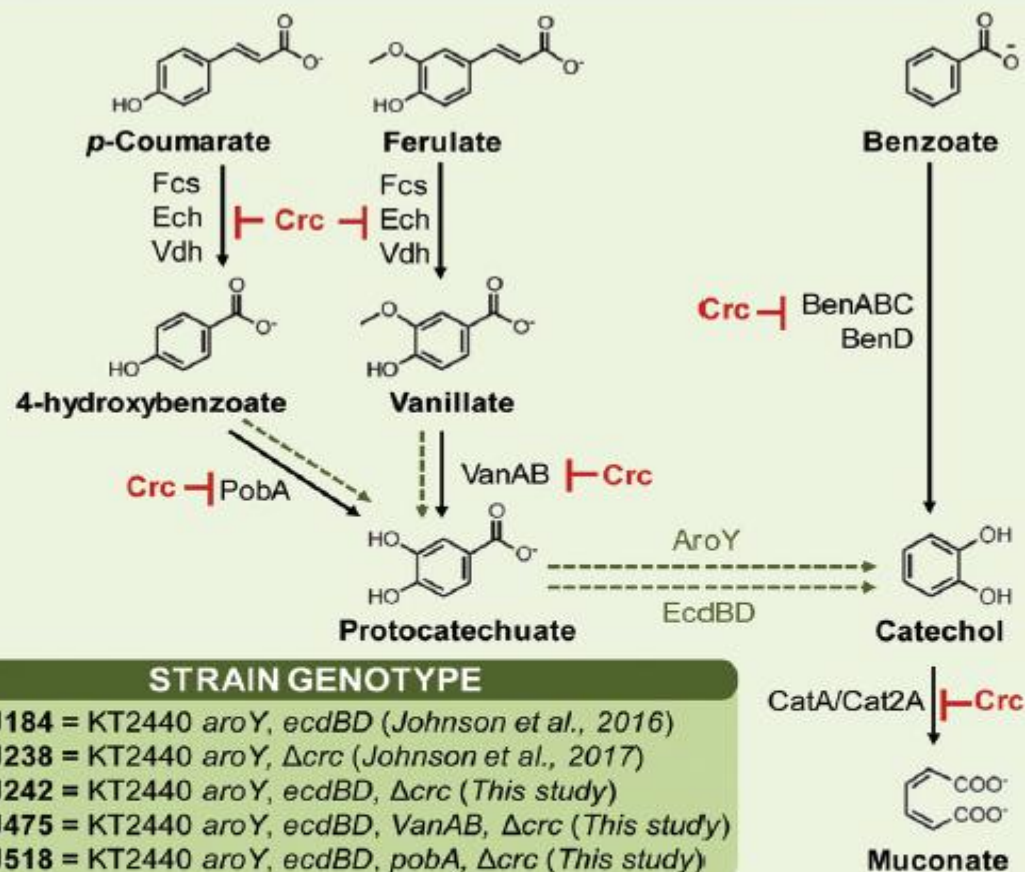
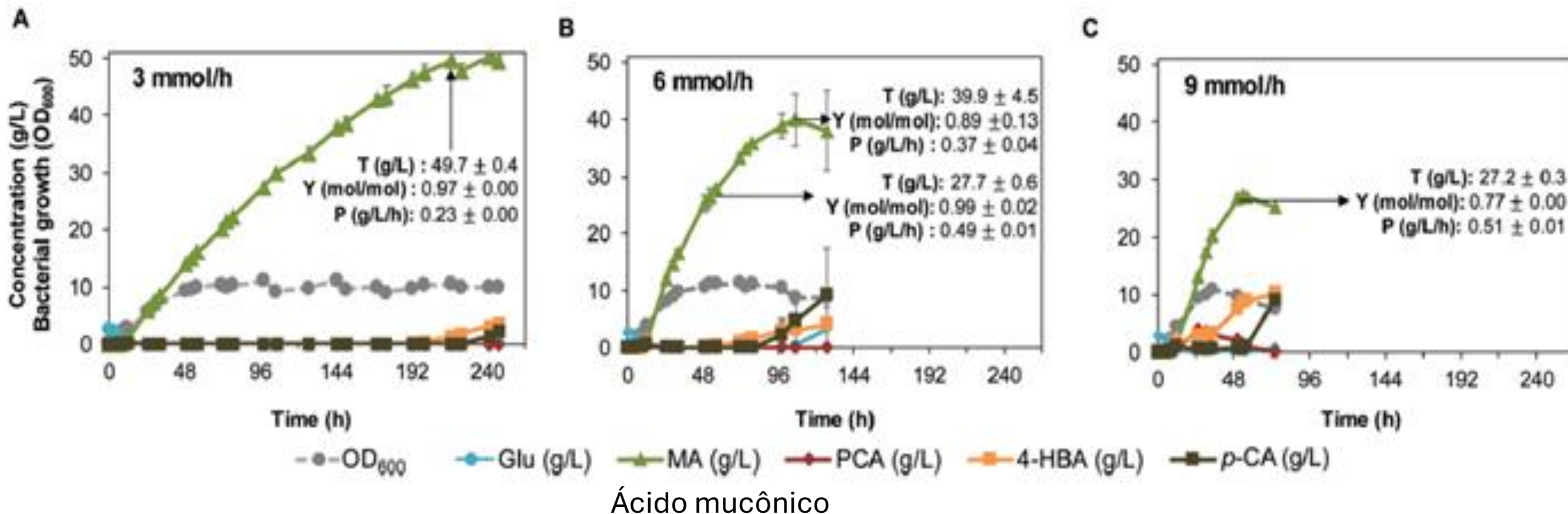


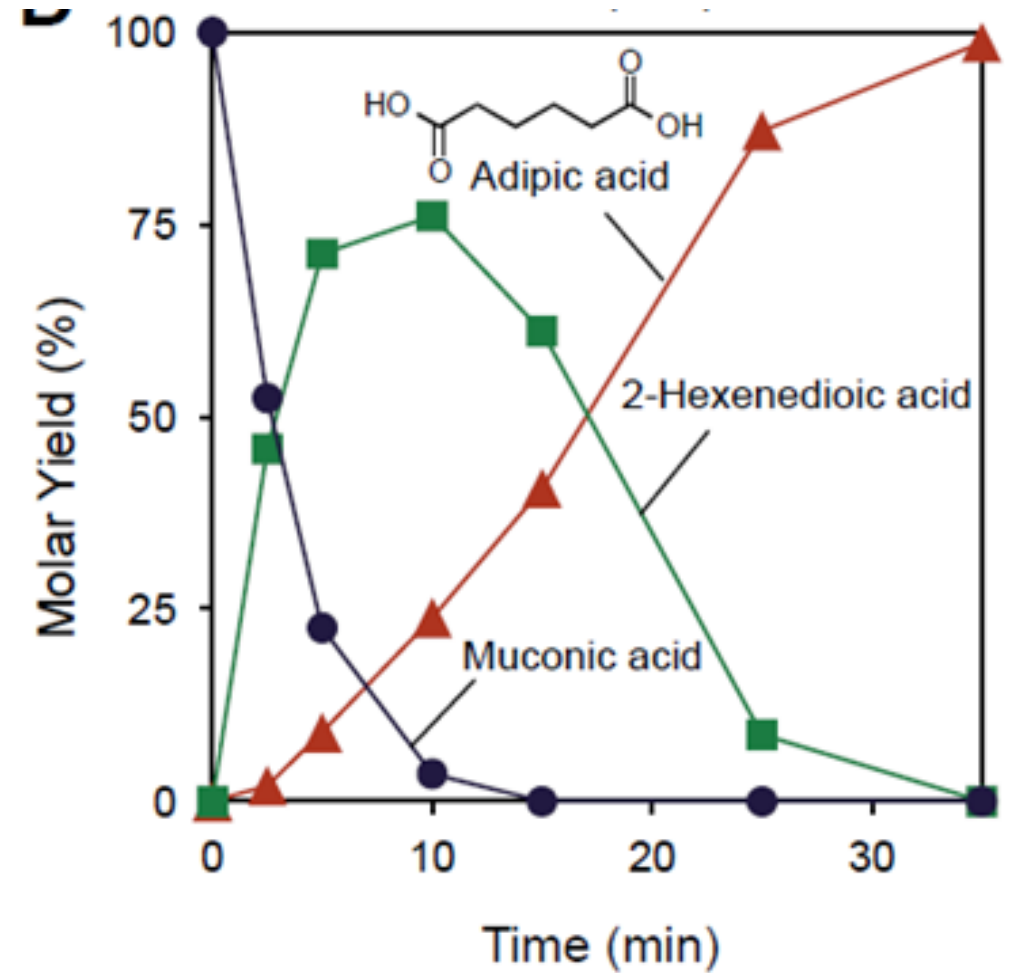
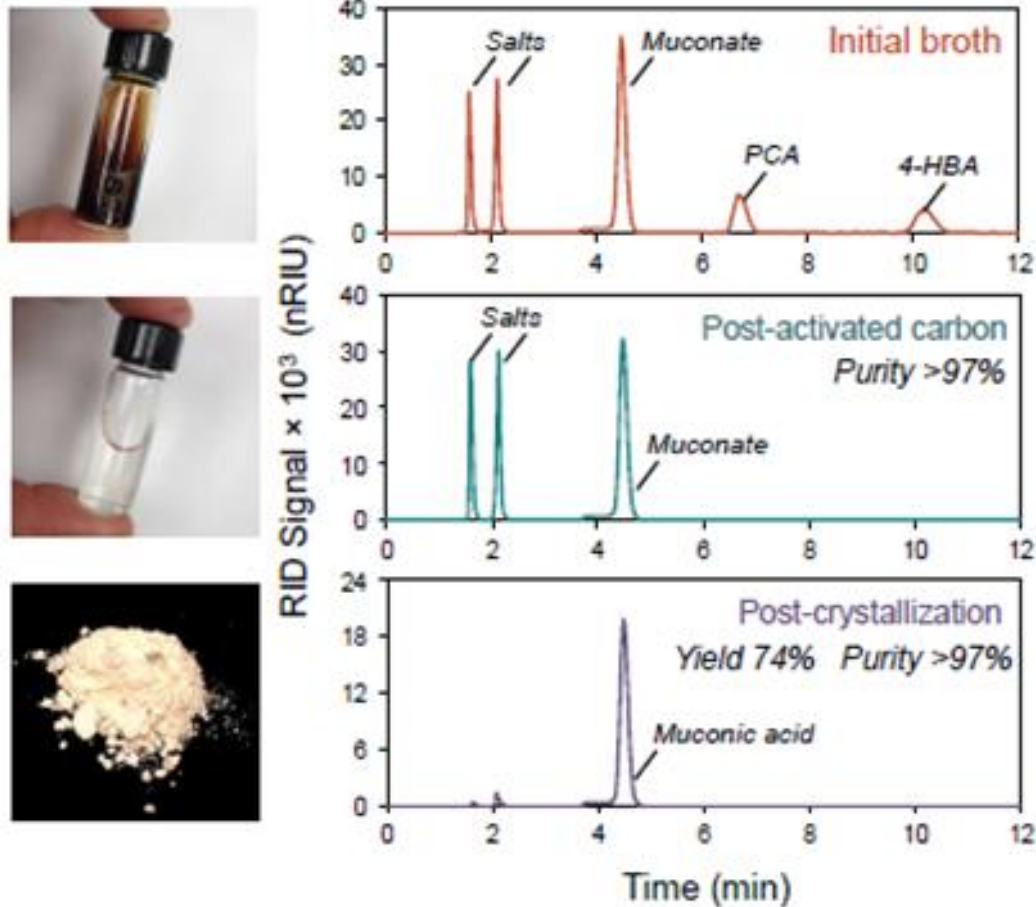
Fig. 1 Overview of metabolic pathways and genotype differences of the MA-producing strains utilized in the current work. The complete genotype is presented in Table S1.† Continuous arrows represent native pathways in *P. putida* KT2440, discontinuous arrows indicate genetic insertions or over expressions, and red markers highlight putative targets for Crc regulation.

Controle do bioprocesso e alimentação fed-batch permite minimizar efeitos tóxicos dos fenóis precursores e atingir níveis de até 50 g/L no meio cultivado



Demonstração experimental de purificação (downstream) do ácido mucônico de via biotecnológica e posterior conversão catalítica (via química) em ácido adípico

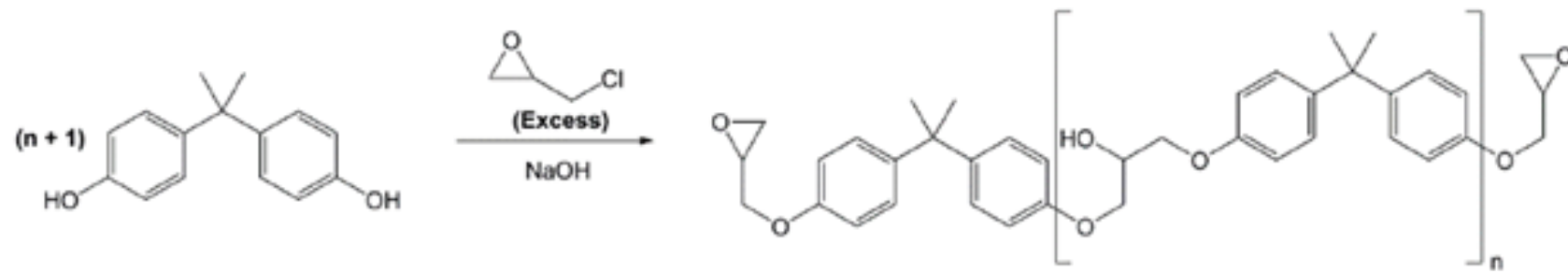
Energy & Environm Sci 8: 617-628, 2015.



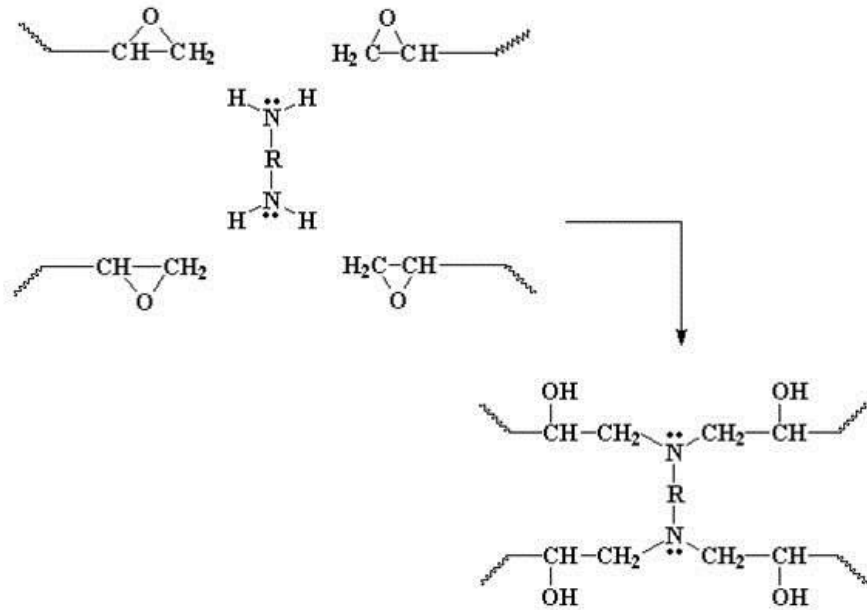
Purificação de ácido mucônico produzido por via biológica a partir de *p*-cumarato

Conversão catalítica de ácido mucônico produzido por via biológica em ácido adípico

Rota convencional de epoxy a partir de bisfenol



Resinas epoxy/amina a partir de bisfenol



Rota com insumo de origem fóssil (atual) para produção de fenol e bisfenol

