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Multi-Scale Technoeconomic Framework for Assessing Viability of Emerging Bio-based Processes

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With recent advances in the development of bioprocesses, several new production schemes utilizing renewable feedstock have emerged for a wide range of chemicals based on several potential host organisms. Many of these have demonstrated promising outcomes in a small scale set up. Hence, lately many efforts were devoted to validate the feasibility of these processes using technoeconomic framework which intended to be used by researchers as one of the major tools to quantify the economic viability and test the potential market vulnerability.

While many exist, one of the major challenges in optimizing such a multifaceted framework is to obtain accurate parameters at various stages of the development of biochemicals¹. This contribution will demonstrate the manner by which these parameters are generated and subsequently linked to a Multi-Sector technoeconomic framework. This framework can be further extended by incorporating modelling of the petrochemical value chain and the de novo prediction of metabolic pathways connecting existing host metabolism to desirable chemical products². Wholly, these models have the capability to capture various attributes of fundamental research and link those with the higher level economic sector, guiding the monetary investment towards the selection of robust candidate biochemicals. The resulting decision support tool can be used to study the existing market and test the viability of bioprocesses while accounting for inter and intra sector interactions in the existing value chain. The traits of this tool, bolstered with detailed models, make it an apt venue to test various renewable process technologies, provide insights towards future production strategies and guide the research to produce bio-based products.

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