HIGHLIGHTS from Task 42 on Biorefineries:

IEA Bioenergy

Classification of Biorefinery systems

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http://www.biorefinery.nl/ieabioenergy-task42/

The main driver for the development of biorefinery is seen by IEA Bioenergy Task 42 in the efficient and cost effective production of transportation biofuels, whereas for the coproduced biomaterials and biochemicals additional economic and environmental benefits might be gained. A biorefinery classification method, recently discussed and approved, has been developed by the Austrian participation in the IEA Bioenergy Task 42. The classification approach relies on four main features which are able to identify, classify and describe different biorefinery systems (put in order of importance): platforms, products, feedstock and conversion processes (**Figure 2**). These features are made of several items (i.e. the type of platform, product and so on), which can be connected each others in order to set up a network (**Figure 3**). A pathway of this network, from feedstock to products, represents a biorefinery system (**Figure 1**). The platforms (C5/C6 sugars, syngas, biogas, H_2 and so on) are intermediate which are able to connect different systems and processes. The number of platforms involved is an indication of system complexity. The two biorefinery product groups are energy (e.g. bioethanol, biodiesel, synthetic biofuels) and material (e.g. chemicals, fibers, food and feed) products. The two feedstock groups are "energy crops" from agriculture and "biomass residues" from agriculture, forestry, trade and industry (e.g. straw, bark, wood chips from forest residues). The four main conversion processes are biochemical, thermochemical, chemical and mechanical/physical processes. Biorefinery systems are classified by quoting the involved platforms, products, feedstocks and, if necessary, processes. An application of this classification method is shown in **Table 1**, where 4 biorefinery case studies are classified. For instance, the first system of Table 1 can be named: "Syngas platform biorefinery for liquid biofuels from lignocellulosic residues"; if required, all the other features and items can be explicated as reported in the table.

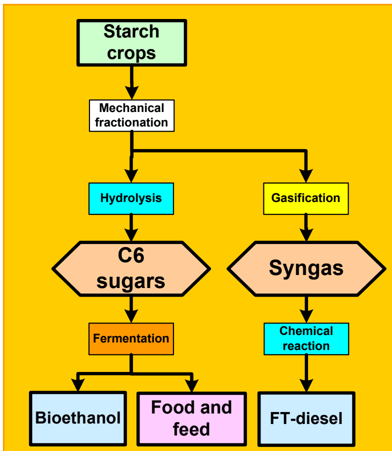


Figure 1: Diagram of a biorefinery pathway.

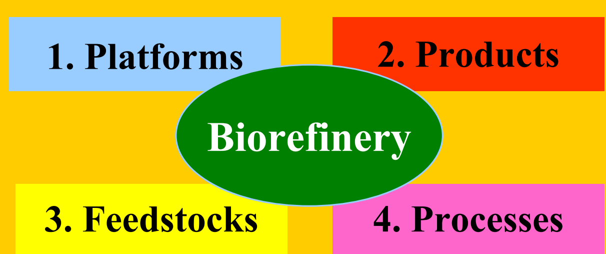
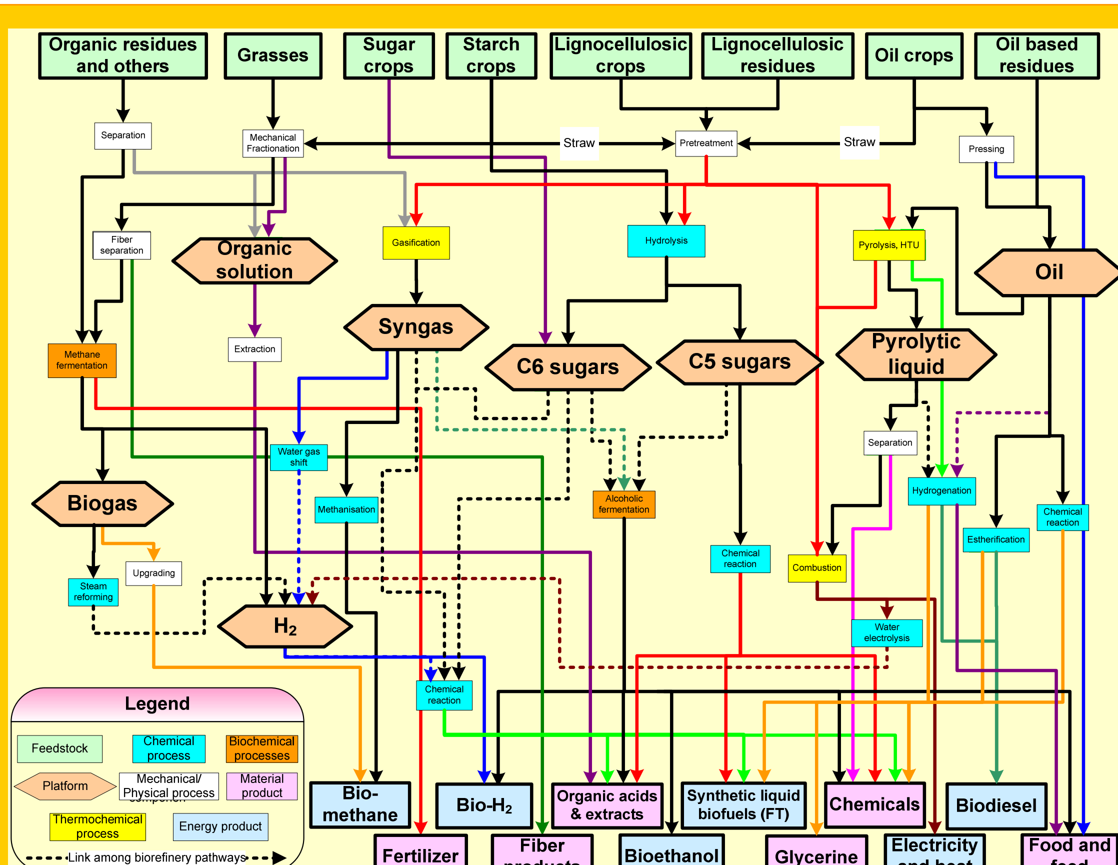


Figure 2: The 4 features needed to classify Biorefinery systems.

Table 1: Examples of classification.

Biorefinery name	Platforms	Products	Feedstock	Processes
Syngas platform for synthetic liquid biofuels from lignocellulosic residues	Syngas	Synthetic liquid biofuels (FT-fuels)	Lignocellulosic residues (forest residues)	Pre-treatment, gasification, chemical reaction
C_5 and C_6 platforms for bioethanol from lignocellulosic residues	C6 sugars, C5 sugars	Bioethanol	Lignocellulosic residues (fibers)	Pre-treatment, hydrolysis, fermentation
Syngas platform for liquid biofuels from lignocellulosic residues	Syngas	Synthetic liquid biofuels (FT-fuels)	Lignocellulosic residues (straw)	Pre-treatment, gasification, chemical reaction
C6 sugars and syngas platform for bioethanol, feed and FT-diesel from starch crops	C6 sugars, Syngas	Bioethanol, feed, synthetic liquid biofuels (FT-diesel)	Starch crop	Fractionation, hydrolysis, fermentation, gasification, chemical synthesis

Figure 3: Network on which the biorefinery system classification method is based.



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