Catalytic Selectivity Engineering in Conversion of Biomass and Waste into Value Added Chemicals, Materials and Energy

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Catalysis will play a great role in conversion of waste to wealth. When the fossil fuels are exhausted in years to come how the world will manage its material and energy needs is a moot question. Biomass of all sorts, carbon dioxide and water will be major sources of material and energy production using novel catalysts and processes. The role of green chemistry and engineering will be more evident when renewable resources are used as feedstock since defunctionalisation of biomass may not be atom economical and newer approaches will be required in these areas. The development of novel solid acids, bases, hydrogenation and oxidation catalysts will be discussed in conversion of biobased chemicals with examples. The principles of selectivity engineering and cascade engineering will also be covered. These products include HMF, levulinic acid, GVL, acrolein, 1,2- and 1,3-propanediols, epichlorohydrin, glycerol carbonate and glycidol. A series of different value added chemicals have been synthesized. The concept of cascade engineering in synthesis of fine chemicals using novel solid acids and solid bases is also proved. New redox catalysts have been synthesized to study the selectivity engineering of fine chemicals. Carbon dioxide conversion into valuable bulk and fine chemicals will also be discussed.