The valorization of lignocellulosic biomass towards the production of fuels, chemicals and materials represents one promising strategy to address the current society’s heavy dependence on the diminishing fossil fuel resources and the associated environmental issues. The development of efficient catalytic processes within this context is currently the focus of many research and development activities, which opens vast opportunities for process intensification especially with regard to the application of continuous flow microreactors. In this presentation, the recent research activities in our group along this research line will be introduced. The presentation will be illustrated by selected examples related to biobased chemical synthesis in multiphase catalytic microreactors, including among others homogeneously catalyzed C5/C6 sugar conversion to furanics and oxidation of 5-hydroxymethylfurfural to promising polymer building blocks (e.g., 2,5-diformylfuran and 2,5-furandicarboxylic acid) in biphasic slug flow microreactors, and heterogeneously catalyzed gas-liquid hydrogenation of levulinic acid to γ-valerolactone in packed bed microreactors. The reactor engineering aspects (microreactor operating principles, process intensification potential) and catalytic chemistry insights (homogeneous and heterogeneous catalysis, reaction mechanism) will be discussed particularly.