Advanced biofuels are produced from cellulosic plant materials or non-traditional oil seeds. Until recently, much of the attention on advanced biofuels has been cellulosic ethanol produced by enzymatic hydrolyzing woody or herbaceous biomass followed by fermentation of the monomeric sugars released by the process. However, there is growing awareness that many applications will require fuels based on hydrocarbons or at least compounds with very low oxygen content. Purely biochemical routes to these “reduced compounds” is theoretically possible but at best are long-term prospects for advanced biofuels. Thermochemical technologies, resembling processes familiar to the petroleum industry, have several advantages including near-term readiness. This talk will describe several promising thermochemical technologies as well as issues of feedstock supply, environmental impacts, and costs.