Milestone Thermodynamics of Renewable Fuels, Platform Chemicals, and Hydrogen Storage

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Biofuels derived from biomass are a promising alternative energy source due to the potential for such fuels to be carbon neutral. Efficient process design requires accurate thermodynamic property information. We set an establishing benchmark thermodynamic properties and prediction of feasibility for the renewable fuel processing and alternative to conventional hydrogen storage technologies as a main goal of this project. The complex of modern thermochemical and theoretical methods was designed, developed and established in the Thermochemical lab at the Samara State Technical University. The procedure included extended experiments, critical evaluation of available data and prediction of the missing thermodynamic properties in order to provide the best possible property values as the milestones for the assessment of the feasibility of processes intended for valorisation of the natural products and the optimal hydrogen storage using favourable chemical reactions. Focus of our project has been on thermodynamic analysis of the following processes: production of dimethylfuran for liquid fuels from biomass, utilization of building block chemicals produced from sugars and lignocellulosic biomass via biological or chemical conversions, and utilization of glycerol. A challenging part of the project has been thermodynamic analysis and selection of liquid organic heteroaromatics for hydrogen storage as an auspicious alternative to conventional technologies.

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