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Liquefied biomass – a feedstock for adhesives and polyurethanes, a source of nanocellulose and a fuel for gas turbine

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Biobased platform chemicals can be provided through lignocellulosic conversion in biorefineries. However to make such a process economical a combination of high-value products generation with bioenergy production is essential. Acid-catalyzed glycolysis of biomass wastes is such an example. This study aims to present some possible pathways how to produce polymers, adhesives, energy, and nanocellulose through the same liquefaction reaction. We used the liquefied wood as a polyol in the polyester synthesis since it contains a large number of hydroxyl groups. The polyester was applied in polyurethane foam production with properties suitable for industrial applications. Liquefied biomass reacts with different reactive sites in thermosetting systems containing melamine – urea – formaldehyde resin and was found that a 50% addition of the liquefied wood met the European standard quality demands for particle boards. Two fuels, namely liquefied cotton fibers and liquefied biomass were used in the gas turbine. Stable combustion was achieved and experimental results indicate successful utilization of the analyzed biofuels in professional gas turbines. The same liquefaction process was used for the isolation of the nanocrystalline cellulose from biomass. The method is a novelty and is a model procedure for NCC isolation from different natural cellulosic sources with high yields and with high crystallinity index.

Biography

Matjaž Kunaver finished his MSc at the University of Leeds, UK in 1991 and has received his PhD degree in 1998 at the University of Leeds, UK. He is a Senior Scientist – Researcher at the National Institute of Chemistry, Department for Polymer Chemistry and Technology, Ljubljana, Slovenia and Associate Professor at the University of Ljubljana and Polymer Technology faculty. His main fields of research are the utilization of biomass as a feedstock for polymer synthesis, energy production and nowadays isolation of nanocellulose with new effective methods. He has published more than 56 original scientific papers and six patents. He is a member of editorial board of several scientific journals.

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