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## Green forest and agricultural waste bio-refinery techniques and breakthrough materials

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The current report describes challenges and opportunities of green chemistry technologies of forest and agriculture integrated bio-refineries for processing the value added from wood-based lignocellulosics and agriculture biomass. Biomass processing employing not only chemical, but also thermochemical and biochemical techniques. The circular forest bio-economy covers forest primary (biomass pre-treatment, pulping technologies, etc.) and secondary (macromolecular components functionalization, biomimetic synthesizing, new micro-, nano-biocomposites processing, etc) and also chemical components separation and downstream processing technologies. The report emphasizes advanced breakthrough approaches, for instance, direct conversion of biomass to electricity, reducing of biomass recalcitrance in biofuels production, electro-, nano-spinning for new textiles, boards without binders from fossil oil, biomimetic hybrid (organic + inorganic) materials, etc. Biorefinery concept includes e.g. ionic liquid, supercritical, steam explosion, treatments of renewables using green chemistry principles. The author tries to explain employed treatments through the changes of complex architecture of lignocellulosics. In structural characterisation crucial role play small and super-small (synchrotron) X-ray or neutron scattering. The topic covers bioinspired modelling and simulation and sometimes bordering with synthetic biology. The report demonstrates high economic, social and environmental importance.

### Biography

Janis Gravitis gained his PhD and DocSci from the former USSR Academy of Science. He is the Author and co-author of more than 300 scientific publications, Visiting Professor at the United Nations University, Institute of Advanced Studies, Tokyo, Japan from 1996–2000. He is the Fellow of the International Academy of Wood Science, Foreign Member of the International Research Centre for Sustainable Materials (Tokyo). He is the Head of the Laboratory of Biomass Eco-Efficient Conversion, Latvian State Institute of Wood Chemistry, currently.

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