

Sustainable Approaches to Utilizing Renewable Natural Resources for the Production of Value-Added Products in Accordance with the Principles of Green Chemistry

The concept of sustainable chemistry or "green chemistry" was introduced in the context of humanity's dependence on natural resources, their excessive exploitation, and the pollution generated by traditional chemical industry, representing a solution to these challenges. This study employs sustainable practices used in the chemical industry, such as heterogeneous catalysis, which contributes to the efficiency of chemical reactions and reduces energy and resource consumption, as well as the use of renewable resources. The interdisciplinary nature of this field allows for the exploration of multiple directions, with the objective of combining heterogeneous catalysis with the use of renewable resources to obtain sustainable products.

The main goal of this doctoral thesis is to obtain value-added products while adhering to the principles of green chemistry: using renewable resources (vegetable oils – linseed and sea buckthorn) and heterogeneous catalysis (Layered Double Hydroxides or LDH materials). Additionally, reactions were carried out in the context of transitioning from traditional to sustainable chemistry, such as the synthesis of alkylpyrazines through gas-phase cyclodehydrogenation on a solid catalyst (mixed oxides derived from LDH).

Thus, the primary aim of this study was achieved by preparing LDH materials using the mechanochemical method and successfully using them in an original way to obtain products from natural sources: photopolymerizable monomers derived from linseed oil and oleogels with sun protection factor based on sea buckthorn oil. Furthermore, the synthesis of alkylpyrazines integrated the topic of transitioning from traditional laboratory chemistry to green chemistry.