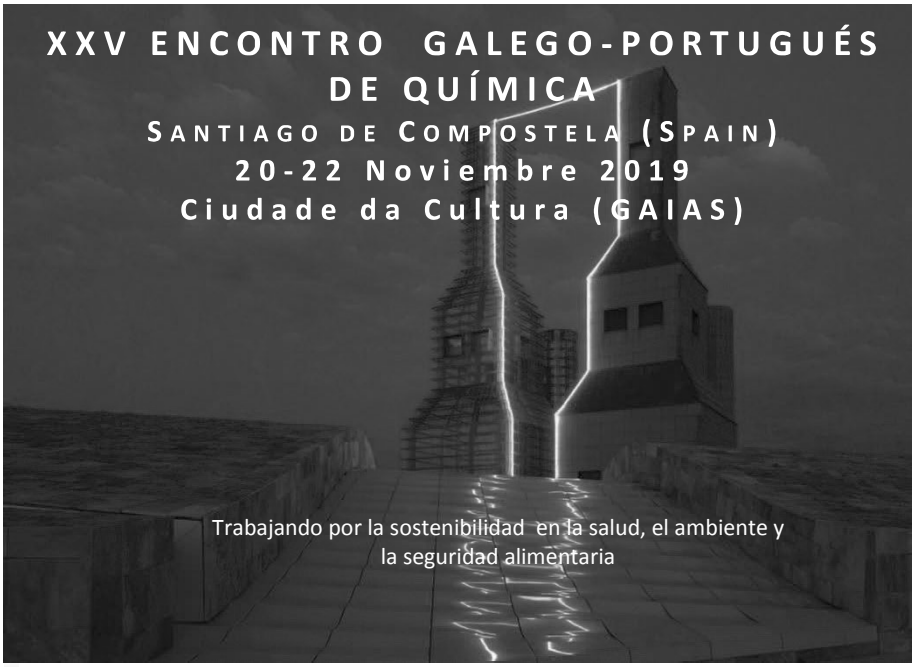

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Study of the Performance of Alkaline Ionic Liquids for the Catalysis of Biodiesel Production from Waste Cooking Oil

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Fossil fuels are a primary energy resource that play a critical role in our daily activities. Currently, the provision of energy relies primarily on fossil fuels such as coal, petroleum and natural gas. Although the fossil-based fuels are satisfying the energy requirements of the world, the depletion of fossil energy reserves, the high demand for fossil fuels and the dependence on it have led researchers to search for sustainable and environmental-friendly energy sources. In this scenario, biodiesel is a sustainable alternative compared to diesel, due to its biodegradability, non-toxicity and low carbon content. Biodiesel can be a blended component in transportation fuels, as it demonstrates similar characteristics to petroleum diesel and has lower greenhouse gas (GHG) emissions [1]. Moreover, there are some concerns related to first-generation biodiesel (derived from food crops), such as the high cost of these oils, which accounts for about 70% of the total value of biodiesel production, as well as the competition with food markets, and the possibility of promoting soil degradation through the uncontrolled stimulation of energy crops [1,2]. Hence, second-generation biodiesel production has a considerable potential to reduce waste residues and GHG emissions by replacing fossil fuels. Waste cooking oils (WCO) are considered a promising alternative in biodiesel synthesis, due to their low cost, high availability and arise as possible alternatives to overcome the disadvantages of the traditional production processes [2].
Therefore, this study focuses on the research of producing biodiesel in a more sustainable way, namely the production of biodiesel from waste oils and the application of an ionic liquid as catalyst. Ionic liquids (ILs) are organic salts composed of cations and anions that can be used in biodiesel catalysis due to their attractive properties, such as good chemical stability, low vapor pressure, ability to be dissolved in a large range of inorganic and organic compounds and simple recovery process [3].
In this work, alkaline ILs, bis-(3-methyl-1-imidazolium-)-ethylene dihydroxide [4] and choline hydroxide [5], were selected for the study of their performance for the catalysis of biodiesel production from WCO samples. The ILs were synthesized, characterised and used for the production of biodiesel batches. Operational parameters such as reaction time, reaction temperature, alcohol/oil molar ratio and catalyst dosage, will be optimized. IL recyclability will be assessed, and kinetic studies will be carried out to determine the activation energy of the transesterification reaction catalysed by the referred ILs.

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