Advances and challenges in the waste plastics valorization by means of catalytic processes

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Resumo/Abstract

Waste plastics generation has increased worldwide in the past decades due to the enhanced production and application of plastics in a huge variety of sectors. Mechanical recycling of plastic wastes is not an easy task due to a number of reasons, such as the occurrence of a high diversity of polymers, their collection mixed with other residues, the low physical compatibility existing between the different types of plastics and the presence of toxic substances (like halogenated compounds). As a consequence, plastics show quite lower recycling rates compared with other materials, ending up in many cases as pollutants in the environment or being just disposed off in landfills, which implies a loss of resources. It is well known that plastics can be converted by thermochemical and catalytic routes into other products useful for the formulation of fuels or as raw chemicals. In recent years, a renewed interest and effort have been focused on these strategies as they may contribute significantly to implement a more eco-friendly management of plastics wastes. In this way, pyrolysis of waste plastics, alone or by co-processing with other materials, is being considered one of the most promising technologies, affording the production of liquid and gaseous products under relatively moderate operation conditions. The incorporation of catalysts into the pyrolysis process may provide important benefits, mainly by narrowing the product distribution and leading to upgraded fuels/chemicals. In addition, catalysts may have a very positive impact in terms of removal of hazardous components. Thus, different types of catalysts are being studied for promoting an efficient dehalogenation of plastic pyrolysis oils. The current presentation will review the recent progress in the development of catalysts for both catalytic pyrolysis and dehalogenation processes of waste plastics, addressing also the main challenges that must be overcome for these technologies to be applied at large scale.