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5th Latin American Congress on

Biorefineries

From laboratory to industrial practice

January 7-9, 2019 - Concepción, Chile

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Enhancing aromatics production from waste tires pyrolyzed over HZSM-5 and Ni/HZSM-5: A Py/GCMS study

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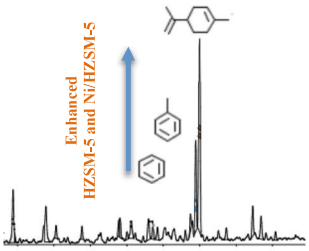
The increasing yearly generation of waste tires, due to the growth of the automotive park in Chile, pose technical and environmental burdens for their disposal and treatment. Particularly, the national mining industry generates tons of waste tires each year, which due to the lack of a conscious and efficient strategy for their treatment, has led to a critical accumulation of this polymeric residue. Disposal of waste tires is a challenging task because tires have a long life and are non-biodegradable. The traditional method of disposal of waste tires have been stockpiling or illegally dumping or landfilling, all of which are short-term solution. In the recent years, the use of thermocatalytic degradation processes has emerged as alternative for treating waste tires [1]. This strategy can led to the production of petroleum-like liquid fuels, carbon black and steel, favoring the establishment of an industrial metabolism for the tire production chain.

With the endeavor of contributing to solve this problem, the present study deals with the catalytic pyrolysis of rubber from waste tires over synthetic zeolite (HZSM-5) and zeolite-supported nickel (Ni-HZSM-5). The effects of catalysts and operation conditions on the composition of pyrolysis vapors were assessed by analytical gas chromatography-mass spectrometry (Py-GCMS). With that aim the Catalyst-to-Waste mass ratios (1:1–10:1) and temperature (450–550 °C) were varied according to a 2^k experimental design. Catalysts were characterized for textural and structural properties, through N_2 adsorption-desorption at 77 K, X-ray diffraction (XRD), scanning electron microscopy coupled to energy dispersive spectroscopy accessory (SEM-EDS) and Transmission Electron Microscopy (TEM). The use of catalysts, increased the composition in aromatic compound, regardless the reaction temperature. Furthermore, the Ni promoted the formation of aliphatic hydrocarbons, while hindered the formation of oxygenated compounds. Effect of intrinsic catalytic properties such as metal dispersion and support nature remains a question. The study will be scaled to BENCH scale seeking to demonstrate reproducibility of the results.



References

[1] Abdulkadir Ayanoğlu, Recep Yumrutaş. (2016). Production of gasoline and diesel like fuels from waste tire oil by using catalytic pyrolysis. *Energy, 103*, 456-468.