Thermal study and emission characteristics of rice husk using TG-MS

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1. Introduction – In rice industry, the main waste that is generated is the husk that covers the grain of rice. This by-product does not have an application in the elaboration of concentrated feed for animals, due to its high content of silica (SIO_2), which significantly reduces its digestibility [1]. Due to its physical-chemical constitution, husk rice is also a waste of very difficult biodegradation. This fact, besides that in the rice processing plants the amount of husk generated is around 20%(wt) of the total production, and considering the very low specific weight of the bulk husk (100 kg m^{-3}), it causes the evacuation and the transport of the husk represents a considerable problem that implies high costs and a harmful impact for the environment [2]. The use of this by-product as a source of energy generation represents an important advance in this direction, viable from the technical point of view, as well as being very convenient from the economic and ecological point of view.
In this work a study of the thermal characteristics of rice husk, as well as its emissions, was carried out to determine the viability of this by-product as a biofuel.

2. Experimental – To carry out this study, rice husk was used from a rice company in the region of Extremadura (Spain). Thermal profiles were determined by thermogravimetry, subjecting the rice husk to different heating ramps, under two different atmospheres (oxidative and inert). At the same time, the detection of various contaminating gases (CO_2, NO_x, SO_2) was carried out, by means of mass spectrometry.
In addition, various thermal characteristics, such as activation energy, were calculated using two different methods (FWO and KAS).

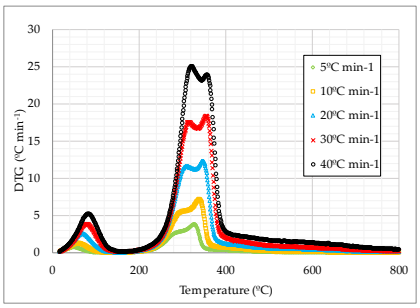

Image 1. DTG curves under inert atmosphere

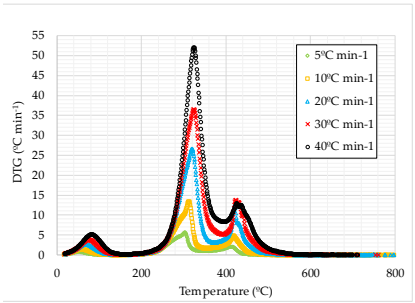

Image 2. DTG curves under oxidative atmosphere

3. Results, Discussion and Coclusions - The results confirm that the rice husk can be used as a biofuel, both for the thermal characteristics observed and for the gases released. However, its use is recommended in the same place where it is generated. It would also be possible to use it more generalized if a densification treatment were carried out (such as pelletizing) to increase its energy density.

4. References

[1] D. Medina, A. Palma, H. Castro, *Actas de Ingeniería*, **2**, (2016) p. 39-45.
[2] Y. Piñeros, et al., "Aplicación de tecnologías para el aprovechamiento de la cascarilla de arroz", Universidad Jorge Tadeo Lozano, Bogotá, 2011.