

10th Edition of International Conference on **Biofuels and Bioenergy**

March 04-05, 2019 Barcelona, Spain

Ana González-Cencerrado et al., Arch Chem Res 2019, Volume 3 DOI: 10.21767/2572-4657-C1-014

Production and assessment of activated carbon for the development of low nitrogen emissions fertilizer

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ntensification of agricultural production is the result of significant growth population over the last century. One of the environmental threats associated with this intensification is the impact of mineral nitrogen fertilizers. Sustainable agriculture requires the use of appropriate fertilizer that favors the reduction of these emissions to the environment. In this context, biochar soil treatment is a reported strategy in the mitigation of nitrogen emissions in agricultural sector. Its capacity to improve soil fertility and to positively affect agricultural N-cycle makes it very suitable in the production of this new product. In this study, activated bio carbon has been produced through a physical activation process in an externally heated quartz tubular reactor. As a first step, several experimental tests have been carried out in order to optimize the production of activated carbon (AC) from local biomass residues (barley straw). The low temperature (500°C) pyrolysis process and the subsequent activation with carbon dioxide have resulted in a high micro porosity AC (789 m²/g BET surface area) which has been used as the basis of the fertilizer. For the new product assessment, two cereal crops (wheat and corn), were chosen and considered under local conditions (climatic and soil related) and typical fertilizer rates (150 kg N/ha and 300 kg N/ha, respectively). Several widely used fertilizers, such as urea, ammonium nitrate (NA), ammonium sulfate (SA) and diammonium phosphate (DAP) were included in the study and compared with the AC based fertilizer. Nitrogen emissions produced by application of each fertilized were estimated and used

as input data for environmental investigation. Finally, the comparative analysis of the new product against the selected fertilizers was carried out using the LCA-based tools oriented to agricultural systems. The results of the environmental analysis showed its ability to save reactive nitrogen in its application to different cereal crops, reaching a maximum saving rate of 65%.



Recent Publications

- Skowronska M and Filipek T (2013) Life cycle assessment of fertilizers: a review. International Agrophysics 28:101-110.
- 2. Spokas K A, Novak J M and Venterea R T (2012) Biochar's role as an alternative N-fertilizer: ammonia capture. Plant and Soil 350:35-42.
- 3. S Gul and J K Whalen (2016) Biochemical cycling



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of nitrogen and phosphorus in biochar-amended soils. Soil Biology and Biochemistry 103:1-15.

- Pallarés J, González-Cencerrado A and Arauzo I (2018) Production and characterization of activated carbon from barley straw by physical activation with carbon dioxide and steam. Biomass and Bioenergy 115:64-73.
- F Brentrup, J Küsters, H Kuhlmann and J Lammel (2004) Environmental impact assessment of agricultural production systems using the life cycle assessment methodology: I. theoretical concept of a LCA method tailored to crop production. European Journal of Agronomy (20)3:247-264.

Biography

Ana González-Cencerrado holds a degree in Environmental Sciences from the University of Salamanca (2004) and a PhD in Renewable Energy and Energy Efficiency from the University of Zaragoza (2014). She has an extensive research experience in this field, which endorses her as an experienced researcher. During her research career she has participated in relevant national and international projects in the field of energy efficiency, biomass and combustion technologies, and recently in the field of environmental analysis of the fertilizer industry.

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