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STUDY OF ALMOND HULLS ACTIVATED CARBONS FROM HIGH TEMPERATURE CARBONIZATION AS SUITABLE FEEDSTOCK IN HEAVIER METALS ABSORPTION

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ABSTRACT

Activated carbons have been widely used as adsorbents in the separation and purification processes for gaseous or aqueous solution systems. Methods for activated carbon production are divided into two pathways: physical activation where the raw material is first carbonized and then carbonized material is further activated by steam or carbon dioxide. The other method is the chemical activation, in which raw material is impregnated with an activating reagents and further heat-treated under an inert atmosphere at high temperatures (500-900°C) here both steps simultaneously takes place.

Currently research proposals within the U.S are focusing their approach on innovative applications of almond hulls to add value to a co-product generated at hulling/shelling process, mostly carried out at the west coast. The physical and chemical properties of bio char typically depends on the feedstock used and the pyrolysis conditions (carbonization temperature, nitrogen flow and residence time). As well-known, absorption of heavier metals and its capability seems to be highly influenced by pH, particle size, porosity, carbonization temperature. In this study physical activation was developed, almond hulls have been pyrolyzed at higher carbonization temperatures, variating activation conditions in order to improve their absorptive properties. The carbonized and activated carbons were characterized in detail using, Thermal Gravimetric Analysis **(TGA),** Brunauer Emmett Teller **(BET),** Fourier-transform infrared spectroscopy **(FT-IR),** Electron Energy Loss Spectrometry **(EELS)** and Wide Angle X-Ray scattering **(WAXS)** analysis.

Overall, raising the pyrolysis temperature increases the aromatic carbon content of the biochar, a property that is believed to improve its resistance to microbial decomposition. Consequently, the key strength of the work presented is the capability to obtain large amounts of either carbonized or activated biochar in short periods and presenting the use of almond hulls/shells as an eco-friendly and low-cost adsorbent, but also as a very promising alternative to remove heavier metals (Cr(VI), Pb2+, Cu2+) in liquid solutions or gas stream. (306 words)