GREEN AND NON-MECHANICAL METHOD FOR PRODUCTION OF COLLOIDAL-SIZE BIOCHAR FROM AGRICULTURE WASTE

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Soil is an important source of nutrient and habitat to microflora. During the past 40 years', the world has lost one-third of its arable land due to an increase in the human population, excessive use of chemical fertilizers, and erosion. There is an urgent need to maintain sustainable approaches in agriculture system. Application of biochar as a soil amendment is a promising approach to improve soil physical, chemical, biological, and hydrological properties. In recent year's special attention has been focused on pyrolysis condition of biomass, although properties can also be enhanced by the reduction in particle size. Small-size biochar attracts increasing interest due to its unique environmental behavior. This research presents a physical method to modify biochar by ultrasonic radiation to produce colloidal size biochar. Agriculture waste biochar (1 cm) was used as a starting material. We used Malvern sonicator "Hydro 2000MU" of 20Hz frequency. Biochar (5gram) was added to 100 ml of deionized water and sonicated for 5 hr; after every 15 min of run time, sonicator was stoped for the next 15 min.

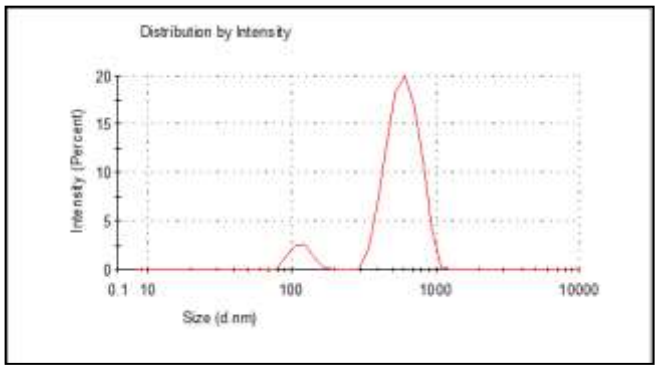

Figure 1. Size distribution by volume

Dynamic light scattering method (DLS) was used to measure the average size distribution of biochar particle. The volume-based particle size distribution of the biochar sample is illustrated in Fig. 1. DLS data showed a bimodal distribution. Two different peaks in nano and colloidal range were observed respectively. According to the histogram, more than 90% of particles were in the range of 400-1000NM. The zeta potential of biochar after sonication was -6.80, shows the stablity of colloidal particles.

The produced colloidal-biochar was characterized by, Fourier transform infrared spectroscopy (FTIR) scanning electron microscopy (SEM). Some physical and chemical properties were also analyzed before and after sonication. (like water-holding capacity, elemental composition, polycyclic aromatic hydrocarbons (PAHs), organic matter). The adsorption test was performed to check the adsorption power of colloidal size biochar in removing harmful pollutants. Results confirm that colloidal size biochar is capable of removing micropollutants (carbamazepine) from aqueous medium. Result also confirm that there were no compositional and structural changes in biochar after sonication. We confirm that our method for the production of colloidal size biochar is green, robust and simple, however, more investigation is needed to reduce the particle size up to the range of 100NM.