Biochar production from waste rubber-wood-sawdust and its potential use in C sequestration: chemicaland physical characterization.

Abstract

Biochars have received increasing attention because of their potential environmental applications such as soil amending and atmospheric C sequestration. In this study, biochar was produced from waste rubber-wood-sawdust. The produced biochars were characterized by Brunauer–Emmett–Teller (BET) gas porosimetry, scanning electron microscopy (SEM), X-ray diffraction (XRD), thermogravimetric analysis (TGA), and Fourier transform infrared spectroscopy (FTIR). Pyrolysis temperature was shown to have a strong influence on both thermal and chemical characteristic of biochar samples. The experimental data shows that the biochar samples can absorb around 5% water by mass (hydrophilic) at lower temperatures (<550 °C), and that lignin is not converted into a hydrophobic polycyclic aromatic hydrocarbon (PAH) matrix. At higher temperatures (>650 °C), biochar samples were thermally stable and became hydrophobic due to the presence of aromatic compounds. Carbon content (over 85%) increased with increasing temperature, and showed an inverse effect to the elemental ratios of H/C and O/C. The very low H/C and O/C ratios obtained for the biochar indicated that carbon in this material is predominantly unsaturated. BET results showed that the sawdust derived biochars have surface areas between 10 and 200 m2 g−1 and FTIR indicated an aromatic functional group about 866 cm−1 in most of the samples. The rate of CO2 adsorption on sawdust derived biochar generally increased with increasing temperature from 450 to 650 °C but then decreased with increase in the production temperature. Derived biochar represents a potential alternative adsorbent for C sequestration.

Keyword: Biochar; Rubber-wood-sawdust; Pyrolysis; Characterization; C sequestration