BIOCHAR – PRODUCT DEVELOPMENT IN REMOTE REGIONS FROM MIXED RESIDUES

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Biochar is a particularly interesting pyrolysis product in regions where there is an abundance of waste biomass to convert but limited ability to effectively turn the waste into a product due to distance to market, lack of infrastructure (e.g. pipelines for gas), and the heterogeneous nature of the biomass (e.g. forestry residues, fishery by-product etc.). Biochar is a more homogeneous material (compared to waste biomass) expanding possible applications, is a less dense solid (making transport less costly), and could be used to sustainably develop an industry/product in these regions. In collaborative work at Memorial University in Newfoundland and Labrador (MUN) and Cape Breton University (CBU) in Nova Scotia we are studying the production of biochar from forestry and fishery residues using slow pyrolysis or fast pyrolysis and investigating possible applications and product development. In this presentation we will summarize characterization work (thermal, physically and chemically) of the char produced from; pyrolysis of softwood and hardwood saw chips, bark, and co-pyrolysis with fishery residues; results of applications we have studied (including gas adsorption of acid gases, AMD, soil amendment); and chemical functionalization of biochar to enhance and/or add specificity to adsorbent properties and for use as specialized heterogeneous materials (catalysis). We will compare the characteristics of the char from slow and fast pyrolysis and pyrolysis of forestry residues and co-pyrolysis forestry/fishery residues (waste mussel shells). There is limited work in co-pyrolysis of forestry and fishery residues, but given the common and remote locations of many fish plants/aquaculture facilities and sawmill operations this work represents an opportunity to not only decrease disposal costs and storage issues but also create an industry in the region through a value added product. We have tested various types of generated chars for adsorbent capacity (as gas/wastewater treatment method and soil amendment) before and after functionalizing the char to determine if we can use green methods to enhance the char qualities. Climate change is already impacting the quality of soils around the world and there are regions, such as Newfoundland, where the soil quality is poor making agriculture challenging. We have show that we can enhance the properties of the soil through combining fish residues and char. While there is significant work in biochar production and applications, this work is unique in its source of biomass (fishery and forestry combinations) and that the product development is geared towards enhancing the sustainability of remote or infrastructure limited regions. The research is co-funded by industrial partners, provincial and federal governments/agencies and represents a truly holistic approach to biochar utilization.