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Abstract

Carbon black is a carbonaceous material (more than 97 wt.% of colloidal carbon) used for tires and rubber production as well as plastics, conductive packaging and inks. It must possess low ash content and, to improve adhesion, convenient amounts of unsaturated functions and graphitic defects. At present, the processes used for carbon black production exploit non-renewable substrates (mainly aromatic hydrocarbons and natural gas) and produce non-negligible amounts of hazardous air pollutants. On the contrary, hydrochar is recognized to have very low environmental impacts. Indeed, hydrochar is a carbon-based material, produced from organic residues or waste substrates during hydrothermal carbonization (HTC), a wet thermochemical process. During HTC, the feedstock undergoes mainly dehydration and carbonization that enhance the colloidal carbon particles formation. For this purpose, HTC was applied to a specific substrate, i.e. the residue classified by the European Waste Catalogue as EWC 19.12.12. This is a by-product of the municipal solid waste (MSW) treatment, supplied by Contarina S.p.A., a company which collects and treats the MSW in the province of Treviso in Italy. The non-recyclable and non-compostable residual fraction of the MSW is treated to produce refuse-derived fuel (RDF). However, a small percentage of this residual is an organic fraction deemed to be contaminated that cannot be used for composting purposes. Thus, this fraction (EWC 19.12.12) is removed and currently bio-stabilized, and then landfilled. The EWC 19.12.12 was therefore carbonized in a 50 mL batch reactor [1] at different HTC conditions, namely three temperatures (180, 220 and 250 °C) and three residence times (1, 3 and 8 hours). The hydrochar yield resulted dependent on the severity of the HTC treatment and ranged from 50% (T=250°C, residence time=8 h) to 64% (T=180°C, residence time=1 h). The main characteristics of the hydrochar were investigated to get insights on the possibility to introduce it as a substitute of the common carbon black [2]. Hence, the chemical composition (elemental analysis, inductively coupled plasma), the crystalline structure (X-ray diffraction), the surface area and the particle size of the hydrochar were characterized. The preliminary results seem to support the possibility to exploit the hydrochar from EWC 19.12.12 as a precursor or a substitute of carbon black.

References

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