

Char in the production of polyurethane insulating materials

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Abstract.

Vegetable biomass can be treated by combustion, gasification or pyrolysis. The combustion takes place in three steps: drying (water evaporation), pyrolysis-gasification (biomass degradation in the absence or partial presence of oxygen), oxidation of coal and combustible gases. The by-product of pyrolysis-gasification is char: a fine-grained vegetable carbon extracted from the bottom of the gasifier. If the use of char as soil or substrate improver has been widely studied in the last 15 years, the application of this substance in construction materials or composites is starting to gain more attention recently. Indeed, in addition to the great advantage of carbon sequestration, the use of char can reduce the energy associated with the production process of such materials, by decreasing the consumption of raw materials.

In this work char with grain size lower than 4 mm and deriving from gasification of biomasses was characterized. Chemical, thermal and physical analyses were made to fully characterize the materials and understand their nature and behaviour. Char was mixed with polyols and other reactants to obtain polyurethane panels for insulating purpose. Polyurethane panels show a decrease of thermal conductivity by increasing the content of char. The addition of char increases the maximum applicable load related to stress relaxation tests and improves the recovery of the load after 10 minutes. Higher elastic modulus values are seen after compressive tests. Electrical conductivity increases in samples containing char.