

Sustainable approach to the thermal conversion of solid residues

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In recent years, there has been growing awareness of the challenges associated with managing large quantities of biowaste, particularly in the context of hop production and processing. This study explores sustainable treatment options for these solid residues through thermal processes such as pyrolysis and torrefaction.

Pyrolysis is a thermochemical process in which biomass is decomposed at high temperatures in the absence of oxygen, leading to the production of bio-oil, syngas, and biochar [1]. Torrefaction, on the other hand, occurs at lower temperatures and primarily focuses on enhancing the physical properties of biomass, improving its energy density, stability, and usability as a fuel [2].

As part of this research, the physical and chemical properties of solid residues from hop production were analysed, and the energy efficiency of both processes was evaluated. The findings indicate that pyrolysis and torrefaction enable the efficient conversion of agricultural residues into high-value products, particularly biochar. Biochar has significant potential as a biofuel and contributes to greater energy self-sufficiency and sustainable development.

Beyond its energy applications, biochar also holds promise in agronomy, as it can serve as a soil enhancer, improving water retention and nutrient availability while reducing greenhouse gas emissions [3]. The use of these thermal conversion processes could not only reduce waste in hop production but also generate economically and environmentally valuable products that support a circular economy [4].

This study provides valuable insights into the optimization of biomass conversion processes and opens new possibilities for the sustainable management of agricultural residues on a broader scale.

References

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