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Transformations of Microplastics in Biosolids Through Hydrothermal Carbonization: A Morphological SEM Study

Zuzanna Prus[1], Klaudia Szkadłubowicz[1], Joanna Mikusińska[1], Krzysztof Berniak[1], Urszula Stachewicz[1], Joanna Chwiej[2], Katarzyna Styszko[3], and Małgorzata Wilk[1]

[1]Faculty of Metals Engineering and Industrial Computer Science, AGH University of Krakow, Poland (zprus@agh.edu.pl)
[2]Faculty of Physics and Applied Computer Science, AGH University of Krakow, Poland
[3]Faculty of Energy and Fuels, AGH University of Krakow, Poland

Hydrothermal Carbonization (HTC) has emerged as a promising technology for treating biosolids. Recently, HTC has gained significant attention in mitigating Microplastic contamination [1]. This study investigates the impact of HTC on the morphology and distribution of Microplastics in biosolids by using scanning electron microscopy (SEM) as a key analytical tool. Biosolid samples were subjected to HTC at three different temperatures: 200, 210, and 220 °C and autogenous pressure to assess the structural transformations of Microplastic. Polymer particles were extracted by 15% H_2O_2 chemical digestion, separated by density using saturated $CaCl_2$ solution and filtered by anodic alumina membrane microfilters. It has been proven that the HTC process causes significant morphological alterations in Microplastics, which are dependent on the severity of the HTC process parameters [1]. Based on previous research, higher temperatures (>220 °C) promote the decomposition and embrittlement of Microplastics the most, reducing particle size and affecting their chemical composition [2]. In this study, the SEM analysis was applied to assess morphological changes, as it can be used to evaluate Microplastic transformations under hydrothermal conditions [3]. After that, the interaction between Microplastics and biosolid matrices during HTC was explored, highlighting the encapsulation and immobilisation of residual particles in hydrochars. This study contributes to the understanding of Microplastic behaviour under hydrothermal conditions and supports the adoption of HTC as an innovative solution for the management of sewage sludge.

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