

DISSERTATION

MSc. Tomasz Mariusz Orliński

Fulvic acids generated in landfills and their use for soil fertilization

Abstract

In this study, analyzes fulvic acids extracted from leachate of selected municipal landfills, differing in the composition of waste and the method of landfill operation.

The literature review characterized municipal waste landfills, focusing on the processes taking place in the deposit, leading to the formation of leachate and the basic processes used in their treatment. Later in the chapter, information on humic substances is presented, from the origins of their discovery to the latest scientific research. The occurrence of humic substances in the environment and their division, the humification process, mathematical models, extraction methods, the composition of humic substances and the currently known structural formulas have been described. The positive and negative properties of humic substances, the chemical reactions in which they take part, as well as the methods of their removal from the environment were characterized.

The part concerning the literature review is continued with the characteristics of the waste landfills covered by the study, i.e. the municipal waste landfills in Barycz, Promnik and Kępny Ług. This chapter presents such information as the location of the landfill, hydrological and hydrogeological conditions, the natural environment and forms of nature protection located in the vicinity of the analyzed landfills. A detailed description of the deposited waste, functioning and operation of the landfill was presented, as well as the quality of the environment in the zone of impact of a given landfill was determined.

The fourth chapter presents the research and analytical methodology. At the beginning, the methodology of isolation of fulvic acids, recommended by the International Society of Humic

Substances (IHSS), and the processes used in the qualitative and quantitative analysis of the extracted fulvic acids were specified. The phytotoxicity test used to evaluate the effect of fulvic acids on plant growth was also characterized. The chapter has been supplemented with photographic documentation showing the various stages of the research.

Chapter four also contains a detailed description and analysis of the obtained research results. The elemental composition of the extracted fulvic acids was analyzed, on the basis of which the atomic quotients were characterized. The pollutants of fulvic acids and the IR spectral bands were analyzed. The analysis focused on the similarities and differences of the research material. The paper presents and analyzes the usefulness of isolated fulvic acids as soil enriching nutrients. The last stage was the statistical analysis of the results of the conducted research. The entire work has been supplemented with tables, charts and photographic documentation presenting the results and analyzes of the research carried out.

The work ends with a short summary and final conclusions from the overall analysis.