ISOLATION AND EVALUATION OF MICROPLASTICS EXTRACTED FROM SEWAGE SLUDGE

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Plastic is inseparable from everyday life. Being cheap, durable, light and easy to form, plastic has practically an unlimited number of possible applications. Despite the great joy of the industry, the public is faceing an unexpected problem - plastic pollution. One of the biggest pollutants is microplastics (MP) – small synthetic water-insoluble solid particles ranging in size from 1μm to 5 mm[1]. It is of increasing concern due to the ecotoxicological risks it poses to aquatic and soil organisms and humans. MP research has gained more attention only in the last decade, but there is still no standardized methodology for its isolation and identification. Most of the research conducted so far focuses on water bodies and its organisms[3]. Nevertheless, microplastics in soil are a major problem, and due to the growing use of sewage sludge in agriculture, it is increasing.

Sewage sludge is a soil conditioner rich in organic matter and nutrients. In North America and Europe, about 50% of the generated sewage sludge is incorporated into the soil. However, despite its beneficial properties, sewage sludge, due to its poor treatment, accumulates many substances harmful to the environment – including MP[4]. There are very few studies covering MP in sewage sludge, and their comparability is poor due to the different methodology used. Therefore, it is extremely important to refine the methodology for the isolation of MP from highly complex matrixes, and to discover a fast and efficient method for its identification. Accordingly, the goal of this study was to determine the most effective conditions of the extraction method and to evaluate the quality of the isolated microplastics.

Sewage sludge was collected from a WWTP in Kaunas, Lithuania. Standard microplastic particles: polyamide, polypropylene, polyethylene – low and high density, were used. In case to remove organic matter (OM) from sewage sludge Fenton's reagent were used. Aqueous iron (II) sulfate solution concentration, reaction time, temperature, and the ratio of hydrogen peroxide to iron (II) sulfate solution were simulated to determine the optimal conditions. Electric stirrer were used to keep a constant temperature and mixing speed at 500rpm. After that, the sample was dried at 105 °C, burned for 4 hours at a temperature of 550 °C, and the OM removal efficiency was calculated. From the tests performed, the 5 best performing methods were selected and evaluated their impact on standard microplastic particles. Using the best-established method, microplastics were isolated from sewage sludge and their qualitative characteristics: size, shape and color were analyzed using a stereomicroscope. In order to evaluate tme movement of microplastic in the enviroment density separation were performed using sodium bromide and distilled water.

The research results will be presented in a poster during the conference.

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