Abstract

The issue of microplastics is becoming increasingly important every year and so is the need for finding solutions. Plastic fragments smaller than 5 mm have already been found all over the planet in all spheres of the environment. Among the crucial factors of resolving this issue are, for example, restrictions in the production and overuse of plastic materials, unification and improvement of the waste management system, prevention of unintended release of plastic waste into the environment, the study of possible toxic effects of microplastics on living organisms, and the development of separation and detection techniques for the precise detection and identification of microplastics and nanoplastics. In recent years, the combination of pyrolysis, gas chromatography, and mass spectrometry (Pyr-GC-MS) has proven to be a potentially suitable instrument for the qualitative and quantitative analysis of these plastic particles. This Master's thesis proves that the Pyr-GC-MS method can, above all, be sensitive and accurate enough for the detection of microplastics in real environmental samples, where the particles are present in very low concentrations. Due to the broad diversity of physical and chemical properties of polymers, it is highly difficult to develop a single analytical method for the whole range of types of microplastic fragments. Therefore, it is important not to underestimate any of the parameters of this method (pyrolytic fission temperature, internal standard, divider flow rate, etc.). All the factors mentioned above were considered in the analysis and properly examined. The optimization of this analytical method and the subsequent construction of calibration bisectors of three representatives of the most produced polymers (polyethylene terephthalate, polypropylene, and polystyrene), which were included in this thesis, proves that this fast and reliable method is applicable for the detection of microplastics in the environment.

Key words: microplastics, detection, pyrolysis-GC-MS, method optimalization, polyethylen terephtalate, polypropylene, polystyrene