

Environmental Surveillance of Microplastics in Burgas Bay Sediments Using μ FTIR Imaging

Sevdalina Turmanova

Department of Materials Science, Burgas State University Prof. Dr. Assen Zlatarov“, Y. Yakimov Str. 1, Burgas, Bulgaria

Dimitrina Kiryakova

Department of Materials Science, Burgas State University Prof. Dr. Assen Zlatarov“, Y. Yakimov Str. 1, Burgas, Bulgaria

Emiliya Ivanova

Department of Ecology and Environmental Protection, Burgas State University Prof. Dr. Assen Zlatarov“, Y. Yakimov Str. 1, Burgas, Bulgaria

Plamena Atanasova

Department of Materials Science, Burgas State University Prof. Dr. Assen Zlatarov“, Y. Yakimov Str. 1, Burgas, Bulgaria

Antoniya Ilieva

Department of Chemical Technologies, Burgas State University Prof. Dr. Assen Zlatarov“, Y. Yakimov Str. 1, Burgas, Bulgaria

Elena Mollova

Department of Ecology and Environmental Protection, Burgas State University Prof. Dr. Assen Zlatarov“, Y. Yakimov Str. 1, Burgas, Bulgaria

Abstract:

This work examines the occurrence and polymer composition of microplastics in marine sediments from Burgas Bay, the western Black Sea. Sediment samples were collected from six stations located in three coastal zones with different anthropogenic pressures. Microplastics were extracted using density separation with NaCl and MgCl₂ solutions, followed by oxidative treatment and μ FTIR imaging analysis. Microplastic abundance ranged from 0.0 to 5497.8 MPs kg⁻¹ dry sediment, depending on the station and extraction solution. In most samples, MgCl₂ resulted in the recovery of more particles than NaCl, indicating higher extraction efficiency for denser polymers. μ FTIR analysis identified nine polymer types. Polyamide was the dominant polymer (48.6%), followed by polypropylene, polyethylene and ethylene vinyl alcohol. The predominance of polyamide suggests an important contribution from fishing-related activities, while polyolefins are likely associated with packaging materials and urban plastic waste. These findings show that Burgas Bay sediments act as a reservoir for microplastic accumulation and highlight the usefulness of μ FTIR imaging in the monitoring of coastal sediment contamination.

Keywords:

Microplastics, marine sediments, Burgas Bay, Black Sea, μ FTIR imaging, polymer composition, density separation, coastal pollution.