

Identification of Common Microplastics in European Rivers using VIS spectroscopy

Abstract: Microplastic pollution in rivers is an increasing concern due to its potential impact on aquatic ecosystems and human health. This study presents an experimental method for roughly identifying the most common microplastics found in European rivers using a spectrometer. The experiment involved the collection and preparation of river water samples, isolation of microplastics, and absorbance spectra analysis. The results were interpreted to provide insights into the types and prevalence of microplastics in the sampled rivers.

1. Introduction

Microplastic pollution is a global issue that affects aquatic environments, including rivers. In European rivers, the most common types of microplastics are polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET). These plastics are widely used in various consumer products and packaging materials, making them more likely to be present in the environment. This study presents an experimental method for roughly identifying these common microplastics in river samples using a spectrometer. The method can be used as an educational tool for middle and high school students to study the impact of plastic pollution on aquatic environments.

2. Materials and Methods

2.1 Sample Collection

River water samples were collected from different locations along the river, ensuring to gather samples from various depths and areas with different levels of pollution or human activity.

2.2 Sample Preparation

The water samples were filtered through fine mesh filters or sieves to separate and concentrate the microplastics from the water.

2.3 Microplastic Isolation

The collected particles were transferred to petri dishes or glass slides, and potential microplastics were identified based on their size, shape, and color.

2.4 Microscopy

The potential microplastics were examined under a microscope or magnifying glass to confirm their plastic nature and further categorize them based on their appearance.

2.5 Spectrometer Analysis

A small portion of each microplastic was dissolved in a suitable solvent specific to the type of plastic. For example, hexane was used for polyethylene (PE), xylene for polypropylene (PP), toluene for polystyrene (PS), and trichloroethylene for polyethylene terephthalate (PET). The absorption spectra of the resulting solutions were measured using a EduVIS spectrometer with a range of 400-700 nm and a resolution of 0.5 nm. The obtained spectra were compared with reference spectra of common plastics to roughly identify the type of plastic or the presence of specific additives.

2.6 Data Recording

All observations, including the appearance of microplastics, the location of the samples, and the spectrometer data, were recorded in a notebook or on a data recording sheet.

3. Results and Discussion

The experiment allowed for the rough identification of the most common microplastics found in European rivers. The absorbance spectra of the dissolved microplastics provided insights into the types of plastics present in the river samples. For example, an absorbance peak around 600-700 nm in a hexane solvent might indicate the presence of polyethylene (PE) microplastics, while a peak around 450-500 nm in xylene might suggest polypropylene (PP) microplastics.

The results can be used to create a general overview of the types and prevalence of microplastics in the sampled rivers. The findings can also be compared to other studies on microplastic pollution in rivers, contributing to the understanding of this environmental issue.

4. Conclusion

This study presented a simple and accessible experimental method for roughly identifying common microplastics in European rivers using a spectrometer. The method can be used as an educational tool for middle and high school students to study the impact of plastic pollution on aquatic environments. However, it should be noted that this experiment provides only a rough identification of microplastics, and more advanced techniques, such as Fourier-transform infrared (FTIR) spectroscopy or Raman spectroscopy, may be required for more accurate identification.