應用熱裂解串聯氣相層析質譜法(Py-GC/MS)分析TSP和PM$_{10}$中的塑膠微粒之研究

Determination of microplastics in TSP and PM$_{10}$ by Pyrolysis-Gas Chromatography Mass Spectrometry (Py-GC/MS)

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ABSTRACT

The extensive dissemination of microplastics (MPs) has made them a major global environmental concern. Though air is the primary medium for microplastics to travel, there are still little studies on their prevalence in the atmosphere compared to the abundance of research on soil, sediment, water, and creatures. In MPs research, sample variability is one of the most challenging problems. The sizes, forms, and chemical compositions of MPs vary, and they are present in a wide range of matrices.

Currently, no standard methodology exists to identify and quantify MPs in environmental matrices. Analytical pyrolysis coupled with gas chromatography and mass spectrometry (Py-GC-MS) is a technique that shows promise for characterizing MPs. This method allows researchers to gather molecular information without being constrained by sample size or shape. Furthermore, the pretreatment of samples requires less time. Thermal breakdown of a sample, which frequently takes place in an inter atmosphere, is the foundation of Py-GC/MS. At a mass of up to 350 mg, the sample is thermally degraded in an inner atmosphere so that the pyrolysis fragments of the polymer structure can be isolated by GC and analyzed by MS.

This study uses PY-GC/MS to determine the concentration of MPs in total suspended particles (TSP) and PM$_{10}$ samples in industrial areas. Twelve popular polymers were mixed and diluted with CaCO$_3$ and SiO$_2$ to provide reference material for calibration curves. The investigation's findings offer important baseline data for assessing the impact of microplastic pollution on human health as well as useful information for tracking the pollution's effects on the ecosystem and possible mitigation strategies.

關鍵字：塑膠微粒、細懸浮微粒、**PM$_{10}$**、熱裂解串聯氣相層析質譜儀
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