

Analytical Technology for Environmentally Hazardous Substances at JFE Techno-Research[†]

1. Introduction

Recycling is being promoted worldwide from the viewpoints of effective utilization of limited resources and preventing further environmental damage.

Technologies for controlling these environmental hazardous substances is important.

JFE Techno-Research has been involved in environmental control at JFE Steel for many years and started analysis of dioxins 20 years ago. Subsequently, the company began practical environmental control.

2. Analytical Technology for Environmentally Hazardous Substances Responding to Legal and Regulatory System

With the number of organizations handling dioxin analysis on a commissioned basis now decreasing, JFE Techno-Research performs analyses of several thousand specimens each year using of 4 high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) devices.

The RoHS 2.0 Directive (Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) in the EU restricts the use of 10 substances, including cadmium, mercury, hexavalent chromium, brominated flame retardants (BFRs), and others, and manufacturers are required to label products

for conformity accordingly. These substances are collectively termed SOC10. Although analytical methods have been specified to a certain extent, various ingenuity is applied to specimen pretreatment processes in order to improve the accuracy of analysis.

Determination of inorganic elements. Various types of chromatography are used for the determination of organic components. Particularly in the case of BFRs, analysis of multiple compounds is necessary; accurate analysis is possible by using the high resolution mass spectrometer employed in analyses of dioxins.

In addition, although not belonging to SOC10, the perfluorooctane sulfonates (PFOS), which are kinds of fluorine compounds, have many excellent properties, such as heat resistance, chemical resistance, etc., but on the other hand, toxicity, including carcinogenesis, has been pointed out in some, and as a result, trace analysis of those substances has become necessary. JFE Techno-Research has the capability to perform such analyses, including analogous compounds of PFOS, which virtually no other companies possess. JFE Techno-Research has also established several kinds of analytical technologies by chromatographic methods, etc., for example, trace determination of nonylphenol, which is regulated in Water Pollution Control Law, as well as analysis of hexamethylene tetramine, which has become a problem because it forms harmful formaldehyde, and others. Among substances that will become a focus of attention in the future, ingredients used in medical products (antibiotics, antimycotics, antiviral agents) may be mentioned. These substances are contained in pharmaceuticals and personal care products (PPCPs) which accumulate in sea areas, rivers, lakes, and marshes, and other bodies of water and have effects similar to the endocrine disruptors. JFE Techno-Research is also successively creating analytical technology which enable analysis of these substances.

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