

Development of a novel GC/MS database for the determination of additives for food packaging into the processed foods

(Received November 1, 2012)

(Accepted January 16, 2013)

Shinya Nakashima^{a, b)}, Hezhe Ji^{b)}, Takashi Yamagami^{a, c)}, Kiyomi Asai^{b)}, Kiwao Kadokami^{c)},
Motoh Mutsuga^{d)}, Yoko Kawamura^{d)}, Ryota Shinohara^{b)}, Koji Arizono^{b)}

a) Nishikawa Keisoku Co., Ltd.

b) Graduate School of Environmental & Symbiotic Science, Prefectural University of Kumamoto

c) Environment and Resources Systems Graduate School of Environmental Engineering, The University of Kitakyushu

d) Division of Food Additives, National Institute of Health Sciences

Abstract

Various types of compounds are used as additives in packaging materials, and their number is increasing each year. In this study, we developed a GC/MS database containing information, such as retention times and calibration curves, for 125 additives. The extracts of several processed foods obtained by the stir-bar sportive extraction (SBSE) method were analyzed for additives, such as plasticizers and lubricants, using the database. It was found that the database was useful for the rapid and easy screening analysis of these additives.

Keywords : processed food, additives for packaging materials, simultaneous determination methods, GC/MS (Gas Chromatography Mass Spectrometry), RTL (Retention Time Locking)

I Introduction

Food packages are made from various types of materials, such as plastic, rubber, paper, etc. To increase the performance of these packages, antioxidants, UV stabilizers, lubricants, plasticizers, surfactant and polymerization inhibitors are widely used. The number of additives in food packaging materials (AFP) is increasing every year, and 917 types of AFP are currently listed in Commission Regulation (EU) No. 10/2011. The types and concentrations of the AFP have been reported¹⁻³⁾. However, their concentrations that have migrated into the foods are unknown.

Since food packages are directly in contact with the food, some AFP may migrate into the food. Although analyses of the migrated AFP into foods are required, such studies have not been conducted for all AFP. One reason for this is that the standards for the AFP are often expensive or difficult to purchase. Moreover, these and standard solutions need daily maintenance, the analyses consume a lot of time and are costly.

In contrast, residual pesticides in foods are often analyzed by many laboratories. Therefore, some AFP were also identified and quantified in the processed foods during the pesticide residue examinations.⁴⁻⁵⁾ A database, which includes information from the calibration curves from GC/MS analyses, has been established mainly for residual pesticides. Using this database, a screening semi-quantification method that does not require standards for target chemicals has been put into practical use. If a database of the AFP would be developed, the AFP could be determined with along the pesticides at once and a huge number of foods would be evaluated. The development of a database, which can simultaneously perform analyses of residual pesticides, has been reported by Kadokami et al^{6, 7)}. We have tried to develop a database which combines pesticides and the AFP. This approach will enable the determination of both the types and concentrations of the AFP in foods. This database will also provide useful information about the migration of AFP into foods.

Therefore, we have created a database of 125 AFP. The