SCREENING OF DIFFERENT CHEMICAL COMPOUNDS IN FATTY FOOD-PACKAGING

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INTRODUCTION

Food packaging has become an indispensable element in the food manufacturing process because the packaging protects the food from contamination and retains its nutritional properties and sensory characteristics. Polymeric films are commonly used as food packaging due to their versatility and capability to offer a wide range of properties. In some cases, the functionality and properties are further enhanced by combining different polymer layers to form multilayer structures.

It has been found that packaging could represent a source of contamination through the migration of different substances from the packaging into food. It is known that the fat content of food products is a factor that affects the migration process, for many chemicals the migration occurs to a greater extent in fatty foods compared to low-fat foods. This increase is due to the higher solubility of the migrating organic compounds in fat. The safety and quality of food products may be affected when the amount of these migrating compounds in food exceed their specified limits (1-4).

In this work, a screening approach was applied to simply and rapidly determine the identity of potential migrants in the packaging through the solvent extraction technique, followed by gas chromatography with mass spectrometry (GC-MS). Moreover the type of packaging material was tentatively identified by IR with Attenuated Total Reflection.

MATERIALS AND METHODS

Seven food-packaging samples of dry-fatty foods comprising snacks and biscuits were purchased in a local supermarket. The fat content of the samples ranged from 10% to 50%. Two different extraction conditions were tested:

Extract of the packaging (of known surface area) → Immersion in 25mL of acetonitrile → Stored at 70°C for 24h
Extract of the packaging (of known surface area) → Immersion in 25mL of hexane → Stored at 60°C for 4h
→ Evaporate 10mL using a stream of nitrogen to 1mL → Filter an aliquot and analyze by GC-MS

Figure 1: Trace 1300 Series Gas Chromatograph with a Trace ISQ LT mass detector and an AI 1310 autosampler.

Column	ZB-5MS (30 m x 0,25 mm x 0,25µm)
Carrier gas	Helium 1mL/min
Injection	Splitless mode
Injection volumen	1µL
Tª program	Initial temperature: 40°C/2min 9°C/min to 300°C for 3/10min
Data acquisition	m/z range of 30-500
Mass detector	Electron impact
Detector Tª	300°C
Transfer line Tª	300°C
Spectrum library	Wiley 8th & NIST/EPA/NIH 11 Mass spectral library (version 2.0)

Table 1: Experimental conditions of GC-MS method.

RESULTS AND DISCUSSION

The GC/MS method developed allowed to simply and rapidly detect chemicals of different nature in the analyzed samples. Substances employed in the manufacture of plastic materials were identified in the two extracts (acetonitrile and hexane). The results were obtained, after the comparison of the sample mass spectra with available mass spectral libraries and the confirmation with commercially standards.

Further studies will be conducted in order to evaluate the migration into the foodstuffs.

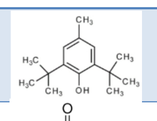
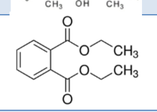
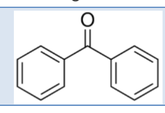
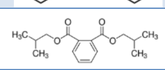
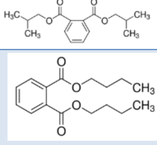
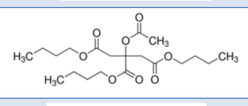
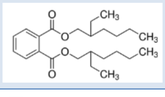
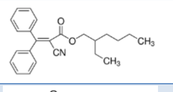
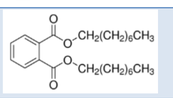
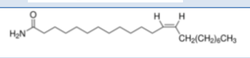
RT	Name	CAS no.	Formula	Use
16.20	Butylated hydroxytoluene	128-37-0		Antioxidant
17.35	Diethyl phthalate	84-66-2		Plasticizer
18.00	Benzophenone	119-61-9		Photoinitiator
20.67	Diisobutyl phthalate	84-69-5		Plasticizer
21.74	Dibutyl phthalate	84-74-2		Plasticizer
24.75	Acetyl tributyl citrate	77-90-7		Plasticizer
27.32	Bis(2-ethylhexyl) phthalate	117-81-7		Plasticizer
28.33	Octocrylene	6197-30-4		UV filter
28.96	Di-n-octyl phthalate	117-84-0		Plasticizer
29.41	13-docosenamide	112-84-5		Slip agent

Table 2: Some of the chemicals identified in the acetonitrile and hexane extracts of the food packaging analyzed.

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