



Determination of Chemicals Released from Single Use Low Density Polyethylene Plastic Bags



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Introduction

The use of plastics has increased manifold, owing to their inexpensive, multipurpose, durable and lightweight nature. Plastics are made with various types of polymer, including Low Density Polyethylene (LDPE). But plastic can contain smaller chemical molecules that are free to migrate into food during contact time and thereby cause health problems. Some additives used in plastic are even carcinogenic or tumorigenic. In Myanmar, many foods are packaged in single use LDPE plastics including fresh meat, vegetables, fast foods, and even some hot foods in daily life. Therefore the present study was aimed to determine the chemicals released from single use LDPE plastic bags that were used in direct contact with hot foods.

Aim

The present study was aimed to determine the chemicals released from single use LDPE plastic bags that were used in direct contact with hot foods in Myanmar.

Results and discussion

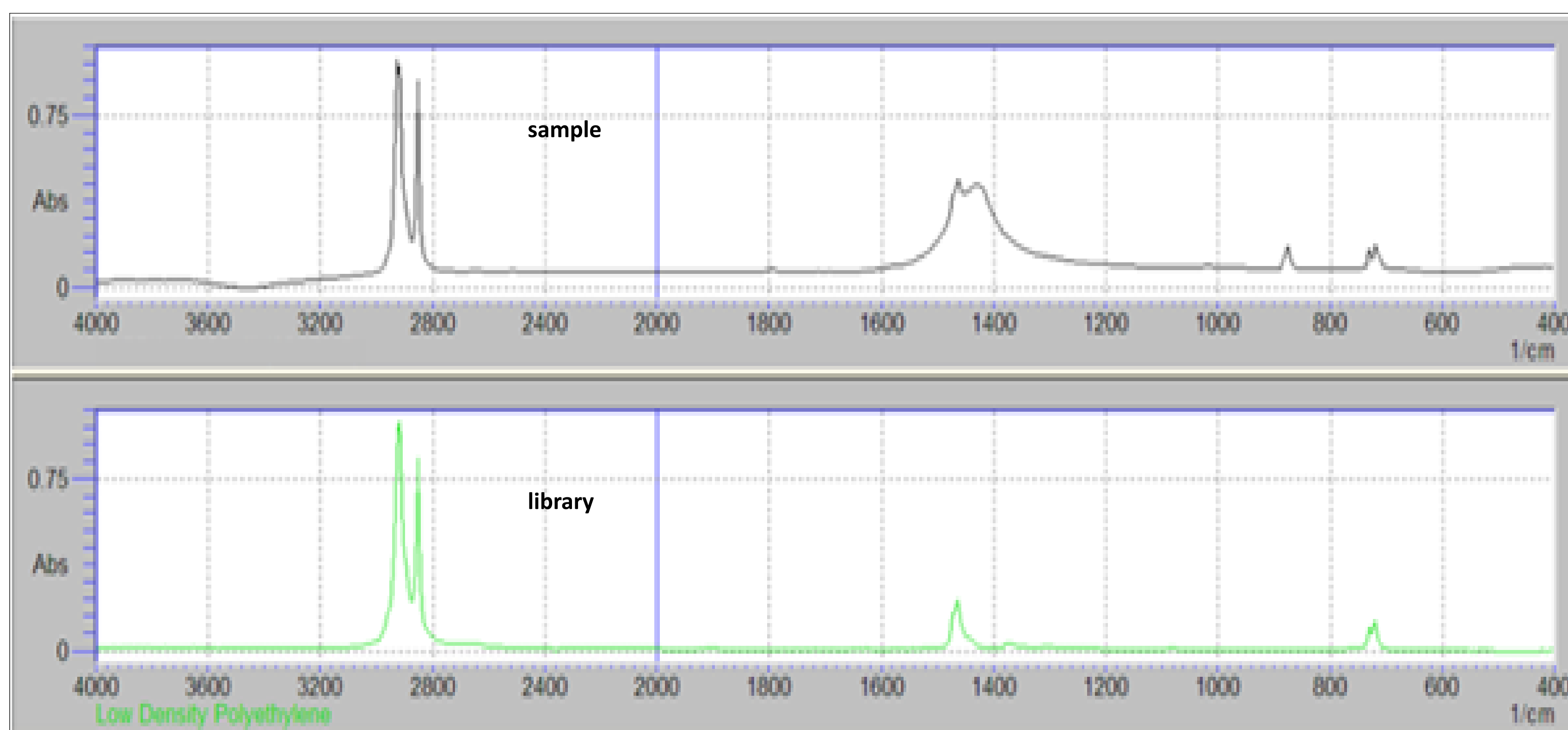
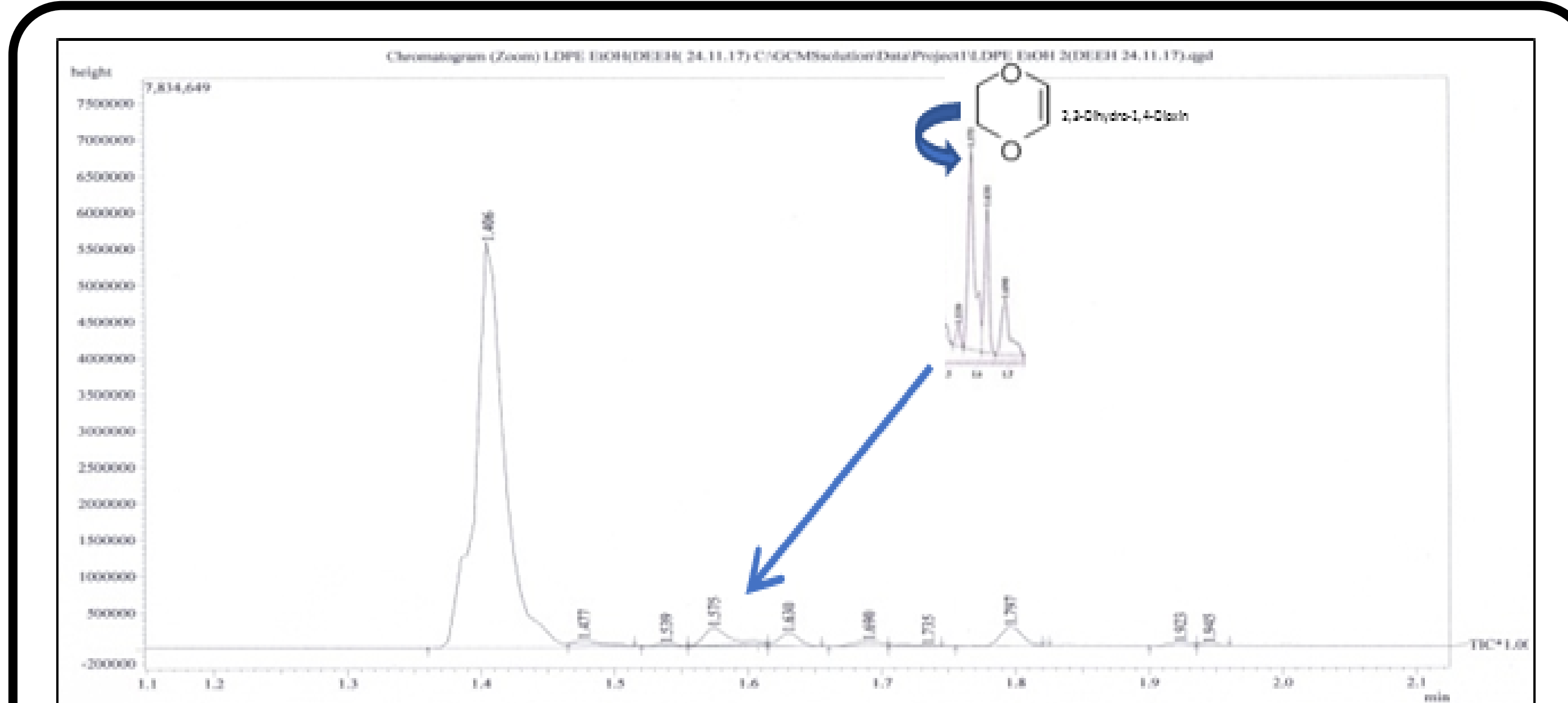


Figure (1) Comparison of FT-IR spectrum of LDPE plastic bag sample and library spectral data

Methods

- ◆ Fourier Transform Infra Red (FTIR) spectroscopy analysis was done for confirmation of LDPE.
- ◆ Extraction of chemicals from LDPE plastic bags was carried out by reflux extraction method using four types of solvents (distilled water, ethanol, chloroform and olive oil).
- ◆ The individual chemicals released from the sample were determined by Gas Chromatography-Mass Spectrometry (GC-MS) with NIST library.
- ◆ Elemental composition of LDPE polymer was analyzed by Wavelength Dispersive X-ray Fluorescence (WDXRF).



Figure(2) GC-MS Spectrum of ethanol extract of LDPE plastic bags

Table(1) Identified compounds from the different extracts of LDPE bags

Extract	Water		Ethanol		Chloroform		Olive oil	
	Name	A %	Name	A %	Name	A %	Name	A %
Identified Compounds	Hexadecanoic acid octyl ester	26.1	3-methoxy 2,2-dimethyl oxirane	84.3	Toluene	69.3	Supraene	76.8
	Octadecanoic acid octyl ester	20.0	2,3-dihydro-1,4-dioxin	3.77	Ethyl benzene	18.1	Nonanal	3.09
	Tetracosane	13.4	1-ethoxy pantane	2.85	1,1-dipro Poxyp propane	4.02	2-decenal	2.97
	9-octadecanoic acid methyl ester	9.28	Tetracosane	2.65	dipropoxy methane	1.56	2-undecenal	3.05
	Others (5 no.)	<1.0	Others (9 no.)	<1.2	Others (12 no.)	<1.0	Others (34 no.)	<1.0

* A% is relative area percent of identified compound

Table(2) Relative abundance of elements in LDPE plastic bag

Elements	Relative Abundance (%)	Elements	Relative Abundance (%)
Ti	0.0587	Cr	0.0029
Al	0.0237	Sr	0.0026
K	0.0123	Fe	0.0025
Si	0.0118	Ag	0.0019
Mg	0.0113	S	0.0014
Cl	0.0093	P	0.0006
Ca	0.0047	Zn	0.0005
Cu	0.0032	Mn	0.0002

Conclusion

The study revealed that tested single use LDPE plastic bags are containing of chemicals that are toxic to human beings such as toluene, ethyl benzene, methyl oxirane, supraene and some type of aldehyde, and even carcinogenic dioxin-like substance such as 2,3-dihydro-1,4-dioxin.

