TBS/AFDC 2(230) P3
ICS 67:250

DRAFT TANZANIA STANDARD

Specification for Plastic Materials for Food Contact Applications Part 2: Polyethylene (PE)

TANZANIA BUREAU OF STANDARDS

0. Forewords

Polyethylene is made by polymerizing ethylene alone or in combination with other monomers, catalysts and various other additives are necessary to polymerize ethylene. Polyethylene polymer as produced may be used with or without further additives to manufacture plastics items for food contact use. In some cases, e.g. in the preparation of plastics film, the plastics material manufacture or the compounder may incorporate additives such as colourants in to the polymer in a post polymerization process.

It is generally accepted that the high molecular weight of polymers makes them essentially inert and insoluble in food and therefore do not pose toxic hazards. However, polymers may contain residues of monomers, low molecular weight polymers, processing aids and substances which are added to the polymer to modify its physical, mechanical or other properties during processing or usage. These residues may migrate into the food which is in contact with the polymer. Therefore, it is essential that the plastic materials and other additives used be such that any migration into the food from such materials are minimized.

The users of polyethylene resin for food contact applications are advised that a written assurance be requested from the suppliers to ensure that the polymeric material contains only the permitted ingredients specified in this Standard. In reporting the result of a test or analysis made in accordance with this standard, if the final values observed or calculated, is to be rounded off it shall be done in accordance with TZS 4 *Rounding off numerical values*.

This standard replaces TZS 237:1984 Code of practice for safe use of polyethylene in contact with foodstuffs, and drinking water. In the preparation of this standards, the assistance obtained from the following publications are gratefully acknowledged: IS 10146:1982 Specification for polyethylene for its safe use in contact with foodstuffs, pharmaceuticals and drinking water (Reaffirmed in 2013) published by Bureau of Indian Standards (BIS).

1.0 Scope

1.1 This Standard prescribes requirements, method of sampling and testing for polyethylene (in the form of granules or powder) for the manufacture of plastic items used in contact with foodstuffs.

2. Normative References

The following referenced standards referred to in the text in such a way that some or all of their content constitutes requirements of this standards. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

AFDC 2 (231) P1: Specification for plastic materials for food contact applications part 3: colorants

AFDC 2(229) P1: Determination of specific and/ or overall migration of constituents of plastics materials and articles intended to come into contact with foodstuffs- Method of analysis

AFDC 2 (227) P2: Guide on suitability of plastics for food packaging

AFDC2 (64) P2: Specification for Plastics Materials for Food Contacts Application Part 4: Polyvinyl Chloride (PVC)

TZS 816: Packaging- glossary of terms in plastics and flexible packaging

TZS 1876: Plastics vocabulary

TZS 2247 Prerequisite Programme on Food Safety-Part 4: Food Packaging Manufacturing

TZS 2247 Prerequisite Programme on Food Safety-Part 4: Food Packaging Manufacturing

3. Terms and definitions

For the purpose of this Standard, the definitions given in TZS 816 and TZS 1876 and the following shall apply:

3.1 Low density polyethylene (LDPE)

A basic resin produced by the polymerization of ethylene having nominal density in the range of 908kg/m^3 to 923kg/m^3 at 27^{o}C (910kg/m^3 to 925kg/m^3 at 23^{o}C)

3.2 Medium density polyethylene (MDPE)

A basic resin produced by polymerization of ethylene and having nominal density in the range of 924kg /m^3 to 938 kg/m^3 at 27^{o}C (926kg/m^3 to 940kg/m^3 at 23^{o}C)

3.3 High density polyethylene (HDPE)

A basic resin produced by polymerization of ethylene and having nominal density in the range of 939kg/m^3 to 963kg/m^3 at 27^{o}C (941kg/m^3 to 965kg/m^3 at 23^{o}C). Copolymers of ethylene with l-alkenes containing up to 8 carbon atoms with minimum ethylene content of 85 per cent and having nominal density of 939kg/m^3 to 963kg/m^3 at 27^{o}C (941kg/m^3 to 965kg/m^3 at 23^{o}C) also come under this definition.

3.4 Linear low-density polyethylene (LLDPE)

A basic resin (terpolymers or quattro polymers of ethylene with polypropylene) produced by polymerization of ethylene with comonomers of l-alkene containing up to 8 carbon atoms with a minimum ethylene content of 85 percent by mass and having a nominal density in the range of 900kg/m^3 to 938kg/m^3 at 27^{o}C.

4. Requirements

4.1 Basic resin

4.1.1 Homopolymers of ethylene, copolymers or terpolymers of ethylene with the l-alkenes defined under Clause 3.1 to 3.4 blend of homopolymers of ethylene with one or more of the copolymers/terpolymers/ quattro polymers and blend of several copolymers/terpolymers/quattro polymers of ethylene mentioned under this clause

4.1.2 Compliance with the list of polyethylene defined in Clause 3.1 to 3.4 shall be made in such a way that it contains no residues or ingredients used in its manufacture other than those listed in clause 4.2, 4.3 and/or 4.4.

4.2 Process residues

4.2.1 Polyethylene may contain a total of not more than 0.2 percent by mass of ethylene and other hydrocarbons originating from ethylene and comonomer feed stock, aldehydes, ketones and organic peroxides or their decomposition products.

4.2.2 The total amount of the following metals, resulting from the use of catalysts, remaining in the polypropylene shall not exceed 0.2 percent by mass (expressed as the element) of the polypropylene when measured by agreed assay technique.

4.2.2.1 Calcium;

4.2.2.2 Aluminium;

4.2.2.3 Silicon,

4.2.2.4 Titanium,

4.2.2.5 Magnesium,

4.2.2.6 Sodium carbonate;

4.2.2.7 Potassium carbonate;

4.2.2.8 Sodium chloride;

4.2.2.9 Potassium chloride; and

4.2.2.10 Petroleum hydrocarbon fractions;

4.3 Catalyst residues

The residues of the catalyst and their products of decomposition shall not exceed 0.2 per cent by mass of the polyethylene material, when measured by relevant test methods.

4.4 Emulsifying and suspension agents

4.4.1 the following emulsifying and suspension agents may be used in the production of polyethylene provided that their total content remaining in the polyethylene does not exceed 0.5 per cent by mass of the finished polymer:

4.4.1.1 Alkyl, Benzene, Alkyl-benzene Sulphates of Sodium, Potassium and Ammonium, the alkyl group containing C_{10} to C_{20};

4.4.1.2 Alkyl, Benzene, Alkyl-benzene Sulphonates of Sodium, Potassium and Ammonium, the alkyl group containing C_{10} to C_{20};

4.4.1.3 Condensation products of ethylene oxide with monohydric aliphatic alcohols (C_{12} to C_{20}) and their Sodium sulphates;

4.4.1.4 Condensation products of ethylene oxide with monobasic aliphatic acids C_{12} to C_{20} and their Sodium and Ammonium sulphates;

4.4.1.5 Condensation products of propylene oxide with monobasic aliphatic acids (C_{12} to C_{20}) and their Sodium and Ammonium sulphates;

4.4.1.6 Polyvinyl alcohols (viscosity of a 4 per cent aqueous solution at 20°C should be at least 0.004 $N \cdot s/m^2$);
4.4.1.7 Magnesium, Zirconium, Vanadium, Ethoxides/Alcoxides, and C_1 to C_5 alcohols

4.5 Auxiliary items for working

4.5.1 The auxiliary items prescribed in Table 1 given in Annex C if used it shall not exceed the specified limit for each weight/weight of the material given in 3.1 to 3.4.

4.5.2 Pigments and colourants

The pigments and colorants used shall comply with list and limits prescribed in AFDC2 (231) P1

4.6 Extraction tests

The polyethylene polymers shall comply with the extraction requirements specified in Table 2 when tested in accordance with annex A or annex B as appropriate.

TABLE 2 - Limits of extractable substances

S/No (1)	Polymer type (2)	Maximum extractable fraction in n-hexane percent by mass of polymer (3)	Maximum soluble fraction in xylene percent by mass of polymer (4)	Method of test (5)
	Polyethylene homopolymer and copolymer as specified in Clause 4.1.1 used for storing food at normal temperatures and below	5.5		Appendix A
	Polyethylene homopolymer and copolymer as specified in Clause 4.1.1 used for packing or holding food during cooking	2.6		Appendix A
	Polyethylene homopolymer as specified in Clause 4.1.1		11.5	Annex A
	Polyethylene copolymer as specified in Clause 4.1.1		30	Annex B

NOTE: Extractability limitations are specified to control the presence of low-molecular-mass polymer fractions and atactic polyethylene

5. packing, marking and labelling

5.1 Packing

The material shall be suitably packed with suitable liner (food grade) in a container as agreed between the purchaser and the supplier, ensuring good hygienic condition conforming to TZS 2247

5.2 Marking and labelling

Each package shall be marked legibly and indelibly with the following:

a) Name and grade of the material;

b) Any restriction for use;

c) Month and year of manufacture of the material;

d) The name and address of the manufacturer

e) country of origin

f) Trade mark and/or brand name, if any;

g) Batch or code number;

h) The packages shall carry the symbol for food grade (Fig. 1) or the word “for food grade” on it

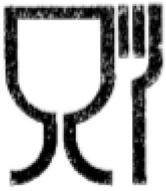

Fig. 1

Annex A
Hexane Extraction Test for Polyethylene Homopolymers and Copolymers

A.1 **Principle**

A sample of polyethylene in the form of a film is extracted with hexane at 50ºC by means of vigorous stirring. The mixture is filtered hot and the filtrate is evaporated to dryness. The residue is then weighed. The result is expressed as the percent by mass of hexane-extractable material in the sample.

NOTE: The sample/solvent ratio is 2.58g/L.

A.2 Apparatus

A.2.1 Two pyrex resin kettles (or equivalent), of 1L capacity with fittings for a reflux condenser, a thermometer and a stirrer. All fittings must be gas-tight.

A.2.2 Electric heating mantles, for the resin kettles with variable voltage heat control (automatic temperature control may be used).

A.2.3 Reflux condensers, with ground joints to fit A.2.1

A.2.4 Filter funnels, 75mm diameter, with stem cut to 40mm.

A.2.5 Erlenmeyer flasks, 1000mL, stoppered.

A.2.6 Disposable Aluminium dishes, washed in xylene to remove any oily coating.

A.2.7 Suitable heating apparatus for solvent evaporation, e.g. a steam bath or hotplate, such that the surface temperature can be controlled at 100ºC.

A.2.8 Suitable vacuum oven, able to be maintained at a temperature of 105ºC and to be evacuated to a pressure of less than 25kPa.

A.2.9 Folded filter paper, 183mm.

NOTE: Whatman No. 2V or Schleicher and Schull No. 595$^{1/2}$ are suitable.

A.2.10 An air – or electric – powered stirrer, explosion proof.

A.2.11 Cylinder of dry nitrogen, fitted with a suitable regulator.

A.3 Reagents

A.3.1 n-Hexane, commercial grade, boiling range 65ºC to 70ºC, density at 15ºC, 0.665kg/L to 0.685kg/L, maximum aromatic content 0.2 percent.

A.3.2 Toluene

A.4 Preparation of Samples

A.4.1 Samples of polyethylene for testing shall be prepared as rapidly cooled film, i.e. Not annealed, such that the thickness of the film does not exceed 0.1mm. The sample consists of 25mm squares of this film.

A.4.2 The sample should be conditioned at ambient temperature for 24h to 48h before testing. Avoid contaminating the sample with grease and use forceps when handling the sample.

A.5 Procedure

A.5.1 Weigh 1.25 ± 0.1 g of the sample to the nearest 0.001g into a resin kettle. Record the mass m_1.

A.5.2 Add 500mL or 338 ± 5g of hexane solvent. Fit the condenser (do not use grease), thermometer and stirrer. Set the stirrer for vigorous agitation and the heater to a predetermined setting to bring the contents to 50ºC within 20min to 25min. As the thermometer reading approaches 45ºC to 47ºC, reduce the heat to a predetermined setting to maintain 50ºC. Do not overshoot 50ºC. Should this occur, discontinue the test. Maintain the temperature of the contents at 49ºC to 50ºC for 2h.

A.5.3 Remove the kettle from the heater and decant the contents while still hot through a folded filter paper held in a short-stemmed funnel. Collect the filtrate in a tared 1000mL stoppered Erlenmeyer flask. Determine the mass of filtrate recovered to the nearest gram. The loss during heating and filtering should not exceed 10 percent.

A.5.4 Evaporate the filtrate to a volume of about 50mL, using a steam bath or hotplate that has a surface temperature not exceeding 100ºC and at the same time ripple the surface of the filtrate with a jet of dry Nitrogen.

A.5.5 Dry a xylene-washed Aluminium dish in the vacuum oven at 105ºC for 1h. Cool the dish in a desiccator and weigh the dish to the nearest 0.1mg. Record the mass m_2.

A.5.6 Transfer the concentrated filtrate from the flask into the dish. Wash the flask with two 15mL portions of warm hexane solvent. Wash the flask with 20mL of hot toluene to remove any insoluble residue. Transfer all of these washings to the dish. Gently evaporate the contents of the dish to dryness by means of the steam bath. At the same time ripple the surface of the filtrate with a stream of dry nitrogen.

A.5.7 Place the dish in the vacuum oven at 105ºC. After 5min, gradually evacuate the oven to a pressure of less than 25kPa. Flush the oven with clean nitrogen at a flow rate of about 21/h for each litre of oven capacity. Remove the dish after 1h and cool it in a desiccator, then weigh to the nearest 0.1mg.

A.5.8 Repeat the vacuum drying, leaving the dish in the oven for 15min to 30min between weightings, until successive weightings agree within 0.5mg. Record the mass m_3.

A.5.9 Carry out a blank evaporation test on 500mL of the solvent, using steps A.5.4, A.5.5, A.5.6 and A.5.7 Record the mass m_3.

A.6 Calculation

Calculate the amount of hexane-extractable material in the sample by the following equation:

Hexane extractable material, percent (m/m) = $\frac{M3 - M2 - MB}{M1}\ x\,100$

where,

m_1 is the mass, in g, of sample;

m_2 is the mass, in g, of empty dish;

m_3 is the mass, in g, of dish with residue; and

m_B is the mass, in g, of evaporation residue from 500mL of the extraction solvent (blank test).

NOTE: Results may be rounded off to the nearest 0.1 percent. Where the sample contains less than 95 percent by mass of polymeric material, m1 shall be corrected to a polymer basis.

Annex B

Xylene extraction test for polyethylene homopolymers and copolymers

B.1 Principle

A sample of polyethylene homopolymer or copolymer is dissolved in xylene by stirring under reflux. The solution is cooled to 25°C in a water bath and held at the temperature for 1 h. Any insoluble material will precipitate out and is removed by filtration. The filtrate is evaporated to dryness and the xylene-soluble materials are determined by weighing.

NOTE The sample/solvent ratio is 5g/L.

B.2 Apparatus

B.2.1 Magnetic stirrer hotplate, fitted with a PTFE-coated stirring bar 40mm in length.

B.2.2 Erlenmeyer flasks, 250mL, with a ground joint.

B.2.3 Water-cooled reflux condensers, to fit C.3.3.

B.2.4 Disposable Aluminium dishes, washed in xylene to remove any oily coating.

B.2.5 Suitable heating apparatus for solvent evaporation, e.g. a steam bath or hotplate, such that the surface temperature can be controlled at 100°C and 120°C.

B.2.6 Suitable vacuum oven, able to be maintained at a temperature of 105°C and to be evacuated to a pressure of less than 25kPa.

B.2.7 Water bath, controlled at a temperature of 25±0.5°C.

B.2.8 Folded filter paper, 183mm.

NOTE: Whatman No. 2V or Schleicher and Schull No. 595½ are suitable.

B.2.9 Cylinder of dry nitrogen, fitted with a suitable regulator.

B.3 Reagent

Xylene inhibited with a suitable hindered phenol antioxidant (see Note).

NOTE: 0.0020g of Irganox 1010 in 1L of xylene is suitable.

B.4 preparation of samples

B.4.1 Polymers in the form of powder shall be dried in the vacuum oven for 30min. Film shall be cut into 10mm to 15mm squares and moulded articles shall be cut into pieces not larger than 4mm cubes.

B.4.2 Polymers in the form of rubs or granules do not require any preparation.

B.5 Procedure

B.5.1 Weigh 0.5g of the sample to the nearest 0.001g. Record the mass m_1. Transfer the sample into the 250 ml Erlenmeyer flask and add 100mL of inhibited xylene by means of a pipette (see Note 1). Place the stirring bar in the flask and fit the condenser (use no grease). Place the assembly on the magnetic stirrer hotplate. Set the stirrer running vigorously and adjust the heater to provide gentle boiling. Heat for 2h under gentle reflux. Check that no deposit of sticky gel has been formed on the bottom of the flask (see Note 2).

NOTES 1: A small wad of cotton wool should be placed in the stem of the pipette, if a rubber pipette filler is used, to prevent contamination of the solvent by perished rubber.

2 The formation of a sticky gel on the bottom of the flask during refluxing may be prevented if an air gap of approximately 3mm is left between the bottom of the flask and the top of the hotplate.

B.5.2 Remove the flask assembly from the hotplate and reposition it so that the flask is immersed in the water bath at a temperature of 25±0.5°C. Do not stir the contents of the flask.

B.5.3 After 60 min remove the flask from the water bath, swirl the flask and immediately filter the complete contents of the flask using a folded filter paper. Collect the filtrate in a 250mL stoppered Erlenmeyer flask (use no grease on the ground stopper joint).

B.5.4 Dry a xylene washed Aluminium dish at 105°C for 1h in the vacuum oven. Cool the dish in a desiccator and weigh to the nearest 0.1mg. Record the mass m_2.

B.5.5 Pipette 75.0mL of the filtrate into the dish. Evaporate the bulk of the solvent at a temperature of between 100°C and 120°C with the aid of a jet of clean nitrogen set at a rate to just ripple the surface of the solvent. Do not allow the temperature to rise above 120°C.

NOTE If the dish will not hold 75mL, add the filtrate in three 25mL portions, evaporating the bulk of the solvent between each addition.

B.5.6 Place the dish in the vacuum oven at 105°C. After 5min evacuate the oven gradually to a pressure of less than 25kPa. Flush the oven with clean nitrogen at a flow rate of about 21/h for each litre of oven capacity. After 1h remove the dish from the oven, cool in a desiccator, and reweigh.

B.5.7 Repeat the vacuum drying, leaving the dish in the oven for 15min to 30min until two successive weightings agree within 0.5mg. Record the mass m_3.

B.5.8 For each new batch of inhibited xylene, carry out a blank evaporation test following Steps B.6.4, B.6.5 and

B.6.6 using 100mL of xylene instead of 75mL of filtrate. Record the mass m_B.

B.6 Calculation

Calculate the amount of xylene-soluble materials in the sample as follows:

Xylene soluble material percent (m/m) = $\frac{M1 - M2\,x\,\frac{V_1}{V_2} - MB}{M1}$

where,

m_1 is the mass, in g, of sample;

m_2 is the mass, in g, of empty dish; m_3 is the mass, in g, of dish with residue;

V_1 is the volume, in mL, of xylene added to sample (i.e.100mL);

V_2 is the volume, in ml, of aliquot taken for evaporation (i.e.75mL); and m_B is the mass, in g, of evaporation residue from 100mL solvent (blank test).

NOTE: Results may be rounded off to the nearest 0.1 percent. Where the sample contains less than 95 percent by mass of polymeric material, m1. shall be corrected to a polymer basis.

Annex C
Table 1- Auxiliary Items

Chemical name	Maximum level of use percent by mass of final product
Aluminium silicate	50
Aluminium stearate	3
Behenic acid	1
Benzene propanoic acid 3-(1,1-dimethyl ethyl) – β (3,1dimethylethyl)-4-hydroxyphenyl-4 –hydroxy – β methyl-1,2 – ethanediyl ester	0.5
1,4-Benzenedicarboxylic acid, bis [2-(1,1-dimethyl ethyl)-6- [[3-(1,1-dimethyl ethyl)-2-hydroxy-5-methyl phenyl] methyl]-4-methyl phenyl] ester	0.075
1,2-Bis (3,5-di-tert-butyl-4-hydroxyhydrocinnamoyl) hydrazine	-
β,3 (or 4)-Bis (octadecylthio) cyclohexylethane	0.3
2,6 Bis (I-methyl heptadecyl)-p-cresol	0.3
3,9-Bis [2-(3-(3-tert-butyl 4-hydroxy-5methylphenyl) propionyloxy)-1,1-dimethylethyl]-2,4,8,10 tetraoxaspiro[5,5] undecane	0.3
5,7-bis 1,1-dimethylethyl-3-hydroxi-2(3H)-benzofuranone, reaction products with o-xylene	0.02
Bis(p-ethylbenzylidene) sorbitol	0.3
2,5 bis 5'-tert-butylbenzoxalyl (2) thiophene	0.02 1)
Bis (2,4-di-tert-butyl phenyl) pentaerythritol diphosphite with up to 1% tri-isopropanolamine	0.1
N, N – Bis (2-hydroxyethyl) alkyl (C12-C18) amine	0.1
2-(3'-tert-Butyl-2'-hydroxy-5'-methyl-phenyl)-5chlorobenzotriazole having melting range of 137-141ºC	0.5
Bis [2,2' methylene bis 4–methyl-6-tert butyl phenol] terephthalate	0.1
Butylated hydroxyanisole	0.05
Butylated hydroxytoluene	0.2
Butyl lactate	5
n-Butyl stearate	5

Chemical name	Maximum level of use percent by mass of final product
Butyric acid, 3,3-bis (3-tert-butyl-4-hydroxyphenyl) ethylene ester	0.5
Calcium benzoate	2
Calcium carbonate	25
Calcium bis [mono ethyl 3,5-di-tert-butyl-4hydroxybenzyl phosphonate]	0.2 2)
Calcium hydroxide	0.1
Calcium octoate	1.5
Calcium oxide	10
Calcium oxide dispersion	20
Calcium palmitate	5
Calcium stearate	5
Carbon black	5
Cyclic neopentanetetrayl bis (octadecyl phosphite)	0.25
4,4’ Cyclohexylidenebis (2-cyclohexyl phenol)	0.1
Citric acid monohydrate	0.01
Dibenzylidene sorbitol	0.25
2,6- Di-tert-butyl-4-ethylphenol	0.01 3)
2,6-Di (α-methyl benzyl)-4-methyl phenol	0.2
3,5-Di-tert-butyl-4-hydroxyhydroeinnamic acid triester with 1,3,5-tris (2-hydroxyethyl)-5-triazine-2,4,6- (1h,3h,5h) trione	0.5
Di-tert-butylphenyl phosphonite condensation with biphenyl	0.1
2,4- Di-tert-butylphenyl-3,5-di-tert-butyl-4-hydroxybenzoate	0.3 1)
Dilauryl thiodipropionate	1.0
Dilauryl thiodipropionate	1.0
Dimethyl dibenzylidene sorbitol	0.4
Distearyl thiodipropionate	1.0
2,4-Dimethoxy-6-(-1-pyrenyl)-s-triazine	0.01
Dimethyl succinate polymer with 4-hydroxy 2,2,6,6tetramethyl 1-	0.3

Chemical name	**Maximum level of use percent by mass of final product**
pipendylene ethanol	
Distearyl pentaerythritol diphosphite	0.3
N,N'Distearyl ethylenediamine	5
n-Dodecanol	2
Dolomite	2[4)]
Di-tert-butylphenyl phosphonite condensation product with bisphenyl	0.1
Erucamide	0.2
Epoxidised soya bean oil	0.5
2,2'-Ethylidenebis (4,6-di-tert-butylphenol)	0.05
Fluoroelastomer	-
Fumaric acid	2.5
Glycerine	3.5
Glyceryl oleate	3
Glyceryl monostearate	3
Glyceryl ricinoleate	3
Glyceryl triacetate	30
Heavy liquid paraffin	10
Hexadecyl 3,5-di-tert butyl-4-hydroxy benzoate	0.5
Hydrotalcite (basic magnesium aluminium carbonate hydrate)	0 .3
2- Hydroxy-4-iso-octoxy-benzophenone	0.5
2,2'-Hydroxy-3'-tert-butyl-5'-methylphenyl-5-chlorobenzotriazole (having menting range of 126-132)	0.5
2(2'-Hydroxy 5'-methyl phenyl) benzotriazolle	0.5
2-Hydroxy-4-n-octoxy-benzophenone	3.5
Lauric diethanolamide	0.5
n-laurylsarcosine	0.4[5)]
Magnesium benzoate	2

Chemical name	**Maximum level of use percent by mass of final product**
Magnesium oxide	0.05
Magnesium stearate	1
Maleic anhydride grafted polyethylene	10
Mannitol	2.5
2,2’-Methylene bis (4-methyl-6-tert-butyl phenol)	0.01
2,2’-’-Methylene bis 6- (1-methylcyclo-hexyl)-p-cresol	0.2
4,4’-’-Methylene bis (2’6-di-tert-butyl-phenol)	0.5
Mono & di glycerides of fatty acids	3
7, [2 h Naphtho (1,2-d) triazol-2-yl] 3-phenylcoumarin	0.1
2:1 Nickel complex of 3,5-di-tert-butyl-4-hydroxybenzylmonoethyl phosphonate	0.3
Non-oxidised polyethylene wax	8
Oleamide	0.2
Octadecyl hydroxyhydrocinnamate	0.25
Oxidised bis (hydrogenated tallow alkyl) amine	0.05
2,2’ – Oxamidobis [ethyl-3-(3,5-di-tert-butyl-4hydroxyphenyl) propionate]	0.5
Phosphorous acid, cyclic butylethyl propanediol,2,4,6-tritert-butylphenyl ester	0.2
Phosphoric acid, cyclic neopentaane tetrayl bis (2,4-di-tertbutylphenyl) ester	0.1
Poly [6-morpholino-s-triazine-2,4-diyl [2,2,6,6 – tetremethyl-4-piperidyl-1) imino] hexamethylene[2,2,6,6tetramethyl-4-piperidyl) imino]	-
Polyvinyl cyclohexane	0.1
Pentaerythritol	3
Polyisobutylene	5
Polydimethyl siloxane	5
Polyoxyethylene (20) sorbitan monolaurate	3
Polyoxyethylene (20) sorbitan monooleate	3

Chemical name	**Maximum level of use percent by mass of final product**
Polyoxyethylene (20) sorbitan monopalmitate	3
Polyoxyethylene (20) sorbitan monostearate	3
Polyoxyethylene (20) sorbitan tristearate	3
Polyoxyethylene (20) sorbitan trioleate	3
Poly [6 (1,1,3,3-tetramethyl butyl amino) 1,3,5-triazine2,4-diyl][4-(2,2,6,6-tetramethyl-piperidyl)imino]hexamethylene [4-(2,2,6,6 –tetramethylpiperidyl)imino]	0.3
Polypropylene glycol	0.5
Silicon dioxide	10
Sodium alkylsulphonate	2.5
Sorbitan monolaurate	3
Sorbitan monooleate	3
Sorbitan monopalmitate	3
Sorbitan monostearate	3
Sorbitan trioleate	3
Sorbitan tristearate	3
Sodium di (p-tert-butylphenyl) phosphate	0.35
Sodium 2,2’-methylenebis (4,6-di-tert-butylphenyl) phosphate	0.3
2-Stearamido-ethyl stearate	3
Stearic/ palmitic acid	5
Stearamide	0.2
Styrenated p-cresol	0.2 6)
Talc	30
Terpolymer of ethylene propylene and 1,4 hexadlene	25
Tetrakis-(2,4-di-tert-butyl-phenyl)-4,4’-biphenylene diphosphonite	0.2
Tetrakis –[methylene-3-(3’,5’-di-tert-butyl-4’hydroxyphenyl) propionate] methane	0. 5
4,4’-Thio-bis (6-tart-butyl-m-cresol	0.25

Chemical name	**Maximum level of use percent by mass of final product**
Thiodipropionic acid	0.1
Titanium dioxide	20
Tri (mixed mono and dynonyl phenyl) phosphite	1
1,3,5–tris-4-tert-butyl-3-hydroxy-2,6-dimethyl–benzy 1,3,5 –triazine 2,4,6 (1h,3h,5h)- trione	0.1
1,3,5 – tris (3,5-di-tert-butyl-4hydroxyhydrocinnamoyl) hexahydro-s-triazine	0.1
1,3,5–tris (3,5-di-tert-butyl-4-hydroxy-benzyl)-s-triazine2,4,6 (1h,3h,5h) trione	0.1
2– [2,4,8,10–tetrakis (1,1-dimethyl) benzo [d,f] [1,3,2]dioxaphosphepin-6-yl]-N,N-bis [2[[2,4,8,10-tetrakis (1,1dimethylethyl)dibenzo[d,f] [1,3,2]-dioxaphosphepin-6-yl] oxy]ethyl]ethanamine	0.075
Tris (2,4, di-tert-butylphenyl) phosphite	0.2
Trisodium phosphate	0.1
1,1,3 – Tris (2-methyl-4-hydroxy-5-tert-butylphenyl) butane	0.25¹⁾
Vinylidene fluoride/ hexa-fluoropropylene copolymer	0.05
Zinc benzoate	2
Zinc di- (2-ethylhexanoate)	1.5
Zinc stearate	3

1) Non-fatty food only.

2) In polyethylene and its copolymers having density less than 940 Kg/m^3

3) Maximum thickness of article in contact with foodstuff, pharmaceuticals and drinking water shall be 0.0635 cm.

4) Non-acidic food only.

5) Film only.

6) Not by food contact above 65^{o}C.