

**Complete  
revised  
edition**

# WINN



Jodie Rogers reaches semi finals, Atlanta Olympics.

Jodie Rogers wins gold at the 1996 Australian Championships, 3m Springboard.

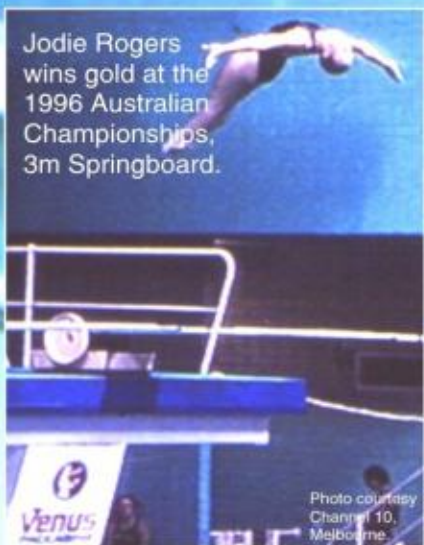


Photo courtesy  
Changri 10,  
Melbourne

# Venus<sup>®</sup> BAG GUIDE



# Venus POLYTHENE BAGS - L

A huge range of stock sizes and thicknesses, some with side gussets, for convenient and attractive packaging of anything from buttons to foods to apparel. (Enquiries regarding custom sizes welcomed) Polythene is the most common and lowest cost transparent plastic bag. Venus stock size bags are made from industrial grade low density polyethylene (LDPE) and most are produced by the blown film method and bottom sealed. LDPE has a high impact strength, is chemically inert, non-toxic, non-static, printable, easily heat sealable, and useable in a wide temperature range: -51 to 66 deg C (-60 to 150 deg F). Venus supplies a variety of sealing methods including heat sealing, neck taping, neck clipping, and paper and vinyl twist ties.



Width inches	mm	Length inches	mm	Thickness inches	um	Width inches	mm	Length inches	mm	Thickness inches	um
2 1/2	65	3	75	.002	50	6	150	9	230	.001	25
2 1/2	65	3 1/4	83	.0015	38	6	150	9	230	.0012	30
2 1/2	65	3 1/2	90	.0015	38	6	150	9	230	.0015	38
2 1/2	65	4 1/8	102	.001	25	6	150	9	230	.002	50
3	75	4	100	.0015	38	6	150	9	230	.0025	63
3	75	5	130	.0012	30	6	150	10	250	.0012	30
3	75	10 1/2	270	.001	25	6	150	10	250	.0015	38
3	75	10 1/2	270	.002	50	6	150	10	250	.004	100
3	75	15	385	.004	100	6	150	12	305	.0012	30
3 1/2	88	9 1/2	235	.001	25	6	150	24	610	.002	50
*side gusset 2 1/2" (57mm)						6	150	26	660	.0012	30
3 7/8	98	16	400	.004	100	6 1/4	159	9	230	.002	50
4	100	7	180	.001	25	6 1/2	165	9	230	.002	50
*side gusset 1 1/2" (38mm)						6 1/2	165	17	432	.0015	38
4	100	5 3/4	145	.001	25	7	180	9	230	.0012	30
4	100	6	150	.0012	30	7	180	10	255	.0012	30
4	100	6	150	.0015	38	7	180	12	305	.0012	30
4	100	6	150	.002	50	7	180	12	305	.006	150
4	100	6	150	.003	75	7	180	23	585	.0015	38
4	100	6	150	.004	100	7 1/2	190	7	180	.0012	30
4	100	6 1/2	165	.0012	30	8	200	9	230	.0012	30
4	100	6 1/2	165	.002	50	8	200	9	230	.0015	38
4	100	7	180	.0015	38	8	200	10	255	.001	25
4	100	7	180	.002	50	8	200	10	255	.0012	30
4	100	8	200	.005	38	8	200	10	250	.002	50
4	100	15 3/4	394	.004	100	8	200	10	250	.004	100
4 1/2	115	7 3/8	185	.0015	38	8	200	10 1/4	260	.0015	38
4 1/2	115	7 3/4	197	.0012	30	8	200	12	305	.0012	30
4 1/2	115	10	265	.0012	30	8	200	12	305	.003	75
4 5/8	117	16 1/2	413	.004	100	8	200	12	305	.004	100
5	130	5	130	.0012	30	8	200	22	560	.001	25
5	130	6	150	.002	50	8 1/4	210	14	356	.0012	30
5	130	7	180	.0012	30	8 1/2	225	13 1/4	340	.008	200
5	130	7	178	.0015	38	8 1/2	216	15	381	.0012	30
5	130	7	180	.002	50	8 1/2	216	15	381	.0012300**	
5	130	9	230	.0012	30	9	230	12	305	.001	25
5	130	12	305	.0012	30	9	230	12	305	.0012	30
5 1/2	140	16 3/4	425	.006	150	9	230	12"	300"	.001	25
6	150	5 1/2	140	.0012	30	**vented					
6	150	7	180	.005	38	*1 3/4" (45mm) Lip					
6	150	8	200	.002	50	9	230	13	330	.001	25

## Venus POLYTHENE MAGIC SEAL BAGS

Width x Length		RED STRIPE	BLUE STRIPE	WHITE PANEL
inches		40um (.0016")	50um (.0002")	40um (.0016")
inches	mm			
1 1/2 x 2	38 x 50			
2 x 3	50 x 75			
2 1/2 x 3 1/2	64 x 89			
3 x 4	75 x 100			
3 x 5	75 x 125			
3 1/2 x 6	90 x 150			
4 x 5	100 x 125			
4 x 6	100 x 150			
4 x 7	100 x 180			
4 x 8	100 x 205			
5 x 8	125 x 205			
6 x 8	150 x 205			
6 x 9	150 x 230			
7 x 13	180 x 330			
8 x 9	200 x 230			
8 x 10	205 x 255			
8 x 12	200 x 300			
9 x 12	230 x 305			
9 x 13	230 x 330			
9 x 15	230 x 380			
9 1/2 x 13 1/2	240 x 340			
10 x 12	250 x 305			
10 x 13	250 x 330			
11 x 15	280 x 380			
12 x 15	305 x 380			
12 1/2 x 18	320 x 455			
13 x 13	330 x 330			
14 x 16	355 x 405			
15 x 20	380 x 508			

Reclosable, press-seal, low density polyethelene (LDPE) bags. A special quality LDPE is used to provide sufficient hardness around the reclosable seal to ensure the bags stay closed. There are countless packaging, storage and filing uses for versatile Venus Magic Seal bags -- from seeds, coins and other small items to hardware, apparel, and advertising mail-outs.

RED STRIPE: 40um (.0016") thick.  
 BLUE STRIPE: 50um (.0002") thick.  
 25% thicker for items that need extra protection such as photos and important documents.  
 WITH WHITE WRITE-ON PANEL: 40um (.0016") thick.  
 For easy identification of items that need to be labelled such as electronic components, medicines and pills.



## Venus POLYPROPYLENE BAGS

Venus polypropylene bags are made using the blown film extrusion method. They provide a crystal clear presentation for greeting cards, stationery, clothing, confectionery, snack foods, cosmetics etc. Stiffer and more transparent than low density polythene (LDPE), polypropylene requires a higher temperature for heat sealing and has less elongation. It has outstanding gloss and sparkle, low water vapour transmission and excellent resistance to acids, alkalis and organic solvent. Resistance to scuffing, brittling and yellowing keeps packages looking new. It is especially suitable for items exposed to frequent handling and shop soiling. Suitable for use with Venus heat sealers.



Width inches	mm	length inches	mm	thickness inches	um
4	100	6	150	.001	25
4	100	8	204	.001	25
4"	100	8	204	.001	25
5	127	8	204	.001	25
5	127	8	204	.0015	38
5	127	8	204	.002	50
5 1/4	135	8	205	.0012	30
6	150	9	230	.001	25
6	150	9	230	.0015	38
7	178	12	305	.001	25
7	178	12	305	.0015	38
8	204	12	305	.001	25
8	204	12	305	.002	50
9	230	13	330	.0012	30
9	230	15 1/2	394	.0012	30
10	255	16	405	.0012	30
10	255	16	405	.0015	38
11	280	15	380	.0012	30
12	305	16	405	.0015	38
12	305	18	455	.0015	38
12	305	18	455	.002	50
14	355	20	460	.0015	38

## Venus RE-SEALABLE POLYPROPYLENE BAGS

1.50" (38mm) lip with adhesive strip and peel off backing.  
 \*1.25" (32mm) lip.

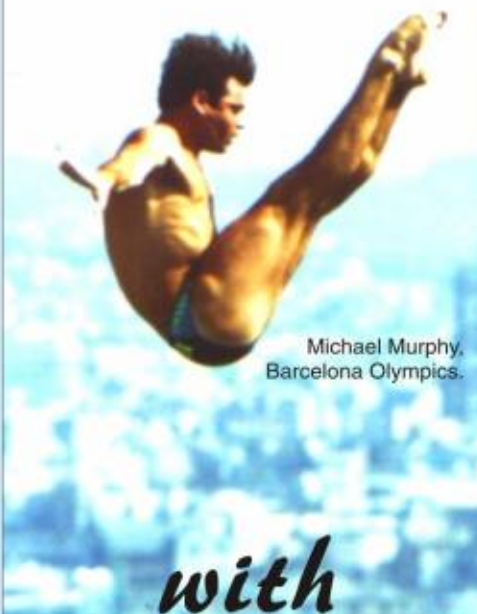
Width inches	mm	length inches	mm	thickness inches	um
4"	100	6	150	.0012	30
5 1/4	135	8	205	.0012	30
6	150	9	230	.0012	30
6.8"	170	6.8	170	.0012	30
9	230	12	305	.0012	30
9	230	13	330	.0012	30
12	305	18	455	.0015	38
14	355	20	460	.0015	38



# LDPE

Width inches	mm	Length inches	mm	Thickness inches	um	Width inches	mm	Length inches	mm	Thickness inches		
9	230	13	330	.001	25	12	305	24	610	.0015	38	
* 1/2" (12mm) Lip												
9	230	13	330	.001	25	14	355	20	510	.0015	38	
* side gusset 1" (25mm)												
9	230	13	330	.0012	30	14	355	20	510	.0025	63	
9	230	13	330	.002	50	14	3/4	375	20	510	.004	100
9	230	15	380	.0012	30	15	380	14	355	.0015	38	
9	230	15	380	.002	50	15	380	15	380	.0012	30	
9	230	16	405	.0012	30	15	380	20	510	.0012	30	
* side gusset 5" (125mm)												
10	250	10	250	.002	50	16	405	12	305	.0005	12	
10	250	12	305	.00125	31	16	405	21	522	.001	25	
* side gusset 11" (280mm)												
10	250	12	305	.003	75	16	405	24	610	.003	75	
10	250	14	355	.0015	38	18	460	24	610	.0012	30	
10	250	15	380	.0012	30	18	460	24	610	.0015	38	
10	250	15	380	.004	100	18	460	26	660	.0015	38	
10	250	16	405	.00125	31	18	460	33	838	.002	50	
10	250	16	405	.0015	38	18	460	33	838	.004	100	
10	250	16	405	.002	50	19	480	29	740	.0025	63	
10	250	17	430	.0015	38	19	3/4	500	29	740	.0025	63
10	250	18	455	.0012	30	20	510	20	510	.0012	30	
10	250	18	455	.002	50	22	560	22	560	.0015	38	
10	250	32	813	.002	50	22	560	34	865	.0008	20	
11	280	15	380	.002	50	22	560	48	1220	.0005	12	
11	280	16	405	.001	25	22	560	48	1220	.001	25	
11	280	17	430	.0012	30	22	560	60	1520	.001	25	
* 1/2" (12mm) Lip												
11	280	18	455	.004	100	24	610	25	635	.002	50	
12	305	16	405	.0005	12	25	630	43	1/2	1104	.003	75
12	305	16	405	.0012	30	28	710	30	760	.0015	38	
12	305	16	405	.0015	38	28	710	39	990	.0012	30	
12	305	16	405	.002	50	28	710	39	990	.0015	38	
12	305	16	405	.006	150	28	710	39	990	.002	50	
12	305	18	455	.0008	20	30	760	70	1780	.002	50	
12	305	18	455	.0012	30	* white						
12	305	18	455	.002	50	36	915	48	1220	.002	50	
12	305	20	510	.001	25	40	1015	48	1220	.002	50	
12	305	20	510	.0012	30	40	1015	60	1500	.002	50	
12	305	20	510	.002	50	40	1015	60	1500	.004	100	
12	305	23	1/2	598	.004	100						

# WIN



Michael Murphy, Barcelona Olympics.

with

# Venus

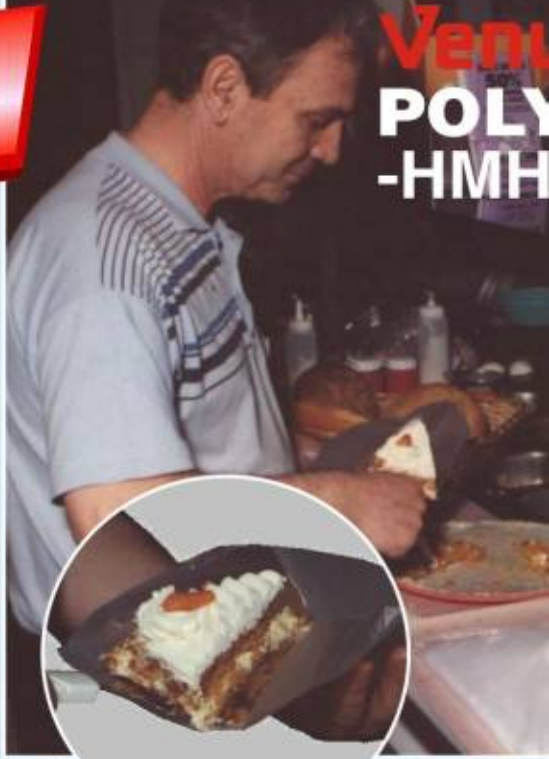
Michael Murphy wins gold in the 3m and 10m events at the Australian Summer titles, 1996.



## MICRO-PERFORATED

Venus micro-perforated polypropylene bags on wickets are made from balanced biaxially oriented polypropylene (BOPP) which has excellent dimensional stability and low temperature durability. It has greater stiffness, tensile strength and impact strength, and can be heat sealed at lower temperatures than non-equally oriented polypropylene. The micro-perforations allow the emission of heat and steam to ensure bakery items and other hot products retain their crispness and freshness. Wicketed bags can be hung from the packing bench or attached to Venus VHIB heat sealers leaving both hands free to fill the bag which is then torn off and heat sealed or twist tied. 250 bags per wicket, 8 wickets per carton. Thickness .0008" (20um). Non-shrinkable.

Width inches	mm	Length inches	mm
6	150	14	350
6	150	28	700
8	200	14	350
10	250	14	350
10	250	20	500
11	280	11	280
11	280	15	380
11	280	20	500



# Venus POLY-HMH



## Venus LDPE ROLLBAGS

Low density polyethelene (LDPE) bags on a roll perforated to suit the Venus Rollbag System. Flanged reel with 27mm diam. core. The Venus Rollbag System is suitable for small runs, eg 1000 packs, and ideal for small, loose items such as dried foods, confectionery, nuts and bolts, buttons, golf balls etc. The items are dropped down the chute from the loading tray into the opened bag. The Rollbag system then heat-seals the bag.



Width inches	mm	length inches	mm	thickness inches	um	Bags per roll	Rolls per ct
3	76	3	76	.002	50	4000	8
4	100	4	100	.0015	38	4000	6
4	100	5	127	.002	50	2000	6
4	100	5	127	.003	75	1500	6
4	100	6	150	.003	75	1500	6
5	127	6	150	.002	50	2000	6
5	127	7	178	.003	75	1250	4
6	150	6	150	.0015	38	2500	4
6	150	8	203	.0015	38	1750	4
6	150	8	203	.003	75	1000	4
7	178	8	203	.002	50	1250	4
8	203	10	250	.002	50	1000	4
8	203	10	250	.004	100	500	4
9	229	10 1/2	267	.002	50	1000	2



Photo courtesy Channel 10, Melbourne.





# Venus POLYTHENE BAGS HDPE

Made from strong, high molecular, high density polyethylene (HMHDPE) with a higher molecular weight and density than ordinary HDPE. This plus the linear molecular structure of HDPE gives these bags greater tensile strength. Venus HMHDPE bags have low oxygen and water vapour transmission properties, medium stiffness, excellent grease resistance and a very wide usable temperature range: -51 to 110 deg C (-60 to 230 deg F). Tough bottom seal.

## Venus HMHDPE PRODUCE BAGS ON ROLLS

1500 bags per roll. 6 rolls per carton.  
(10" x 17" size has 2" (50mm) gusset).

Width		Length		Thickness	
inches	mm	inches	mm	inches	um
10	254	15	380	.0009	9
10	254	17	430	.00085	8.5

## Venus HMHDPE SANDWICH PRODUCE BAGS ON ROLLS

Ideal bags for a wide range of uses including the packaging and storage of frozen products such as meat, fish and vegetables. Also ideal for packing sandwiches. Self-dispensing pack of 1000.

Width		length		thickness	
inches	mm	inches	mm	inches	um
6	152	9	229	.0004	10
6	152	12	300	.0004	10
7	178	7 1/2	184	.0003	8
8	203	10	254	.0004	10
8	203	10	254	.0008	20
8	203	12	305	.0004	10
9	229	14	356	.0003	8
9	229	16	405	.0003	8
10	254	12	305	.0003	8
10	254	16	406	.0004	10
12	305	16	406	.00035	9
12	305	18	457	.00035	9
12	305	18	457	.0004	10
14	365	18	457	.0004	10
25	635	53	1346	.0015	38



## Venus VACUUM PACKING BAGS

The hygienic and appealing way to pack meat, fish, ground coffee and delicatessen products. Venus vacuum packing bags provide an almost total barrier against oxygen transmission. They heat seal tightly and wrinkle free. Suitable for use with the Venus range of Vacuum Chambers.

### CO-EXTRUDED LAMINATED BARRIER BAGS

Five layer lamination: polyethylene-adhesive-nylon-adhesive-polyethylene. Side sealed. 1000 per pack.

### CO-EXTRUDED EMBOSSED VACUUM BAGS

Thickness: 100um. Embossed on one side. Co-extruded 20% polamide 80% polythene. Water vapour transmission: 2.6gm/mq.24hr. Oxygen permeability: 50gm/mq.24hr. Carbon dioxide permeability: 150gm/mq.24hr. Nitrogen permeability 10gm/mq.24hr. (Based on tests at 23C and 85% humidity).

Width		Length		Thickness
mm	external	mm	external	
170	145	200	55	
150	127	230	65	
160	140	200	60	
160	140	230	65	
160	150	250	70	
180	160	230	55	
200	180	255	80	
205	185	260	65	
220	205	260	55	
255	235	380	65	
275	250	380	65	

Width		Length	
mm	external	mm	external
200	180	300	295
250	230	350	340
300	285	400	390
300	280	500	490
400	380	600	590



## Venus POLYTHENE ENVELOPES

Venus self-adhesive envelopes are made from 50 um thick low density polyethelene (LDPE). Reduce postage costs and speed up your cash flow; simply place your invoice or other documents in the pouch, peel off the backing, and stick the envelope to the package. Documentation is easily visible in the window face or full face, plain or printed envelopes. To make Venus envelopes as economical as possible we have reduced the width of the seal. (It's the inside size that counts). Printed with water based inks. Adhesive is synthetic rubber. Most types are white film backed but some are red film backed.



Width x Length		PLAIN	PACKING LIST ENCLOSED	PACKING LIST/ INVOICE ENCL.	PACKING SLIP ENCLOSED	DOCUMENT ENCLOSED	INVOICE ENCLOSED
Inches	mm						
3 3/4 x 6 7/8	95 x 175	F C					
3 1/4 x 6 5/16	82 x 160	VH23					
4 1/2 x 6	113 x 153	C	F W R	F	W	F W R	R W
3 15/16 x 5 3/8	100 x 138	VH4	VH3	VH2	VH6	VH8	VH11
4 1/2 x 8	113 x 203	C					W
3 15/16 x 7 1/2	100 x 190	VH10					VH5
4 1/2 x 5	114 x 127						W
3 3/4 x 4 3/16	96 x 107						VH16
4 1/2 x 5 1/2	114 x 140	C				W	W
3 15/16 x 4 8/8	100 x 120	VH13			VH14	VH15	VH12
6 x 9	150 x 230	C					
5 1/3 x 8 1/2	135 x 215	VH20					
7 1/2 x 12	188 x 300	C					
6 7/8 x 11 1/4	175 x 285	VH30					
9 3/4 x 13 1/2	250 x 343	C	C				
9 x 13	330 x 235	VH40C	VH40				

■ = clear ■ = full face ■ = window face ■ = red back ■ = white front, side opening.



Jodie Rogers  
Atlanta Olympics, 1996.

# Venus FILMS SELECTION GUIDE

## PERFORMANCE COMPARISON

	LDPE	HDPE	POLYPROPYLENE		PVC	
			Non-equally Oriented	Oriented		
<b>CLARITY</b> transparent=tp, translucent=tl, opaque=op	tp to tl	tp to op	tp	tp	tp to pl	
<b>YIELD</b> Square cm <sup>2</sup> per kg (25.4um thick)	426 700	412 477	430 967	419 587	270 243 to 315 760	
<b>SPECIFIC GRAVITY</b> (ie relative density, Water=1)	.910 to .925	.941 to .965	.88 to .90	.88 to .90	1.23 to 1.35	
<b>TENSILE STRENGTH</b> kg square cm <sup>2</sup> (ASTM D 882)	70 to 246	211 to 703	211 to 422	1055 to 2109	141 to 1336	
<b>STRETCH %</b> (ASTM D 822)	225 to 600	5 to 400	200 to 500	200 to 500	5 to 500	
<b>IMPACT STRENGTH</b> kg cm	7 to 11	1 to 3	1 to 3	10 to 25	12 to 20	
<b>TEAR STRENGTH</b> (Elmendorf) gm/ml (ASTM D1922)	100 to 400	15 to 300	40 to 330	40 to 330	Varies widely.	
<b>STIFFNESS</b> gm (handle-o-meter) MD TD	2.5 to 4.5 3.7	8 to 16 10 to 20	11 to 27 11 to 27	11 to 27 20 to 30*	7.5 to 40 10 to 45	
<b>HEAT SEAL RANGE</b> deg C	121 to 177	135 to 154	163 to 204	88 to 132	93 to 177	
<b>WATER VAPOUR TRANS.</b> gm/24hrs/ 1 sq.m/ 38° C/ 90% RH/ (ASTM E 96 Method E1 11)	18	5 to 10	8 to 10	4 to 10	25 plus	
<b>GAS TRANS.</b> cc/ml/ 1 sq.m/24hrs 1 atm/23° C 0% RH (ASTM D 1434)	D <sup>1</sup> CO <sup>2</sup>	3900 to 13000 7700 to 77000	520 to 3900 3900 to 10000	1300 to 6400 7700 to 21000	1300 to 6400 7700 to 21000**	77 to 7500 770 to 55000
<b>RESISTANCE TO GREASES AND OILS</b>	may swell slightly on long immersion.	excellent	excellent	excellent	excellent	
<b>MAX USE TEMPERATURE</b> deg C	66 softens at 110	110	121	121	93 approx. Depends on plasticiser	
<b>MIN USE TEMPERATURE</b> deg C	-51	-51	***		Depends on plasticiser	
<b>DIMENSIONAL CHANGE AT HIGH RH %</b>	None	None	None	None	2'	
<b>FLAMMABILITY</b>	Slow burning	Slow burning	Slow burning	Slow burning	Self extinguishing	
<b>MACHINE PERFORMANCE</b>	Fair/good	Fair/good	Fair/good	Fair/good	Fair/good	
<b>PRINTABILITY</b>	Good if treated	Good if treated	Good if treated	Good if treated	Special inks required	
<b>SEALING</b>	Heat	Heat		Heat	Heat or adhesive	
<b>HEAT SHRINKABLE</b>	Special types	Some types			Some types	

\*Balanced, oriented, stabilised and coated two sides. \*\*Varies according to composition or type and weight of coating.

\*\*\* Non-equally oriented PP films are not recommended where low temperature durability is required.

Oriented, balanced, stabilised coated PP has good low temp durability.

## GLOSSARY OF TERMS USED IN THE PLASTICS INDUSTRY

### MONOMER

The smallest repeating structural unit of a POLYMER.  
Mono = one, Mer = unit.

### POLYMER

A solid substance in the form of a (giant) long chain molecule produced by joining the molecules of a gaseous or liquid substance by chemically and physically modifying them with heat, pressure and catalysts.  
Poly = many, Mer = unit.

### POLYMERIZATION

The process of producing POLYMERS from MONOMERS.

### COPOLYMERIZATION

The process of 'addition polymerization' involving more than one type of mer, eg ethylene and propylene.

### PLASTICS

Products chemically synthesized from petroleum, natural gas, coal and certain agricultural products such as cotton and soybeans. The most important source is petroleum which yields the lightweight gases,

methane, ethylene, propane and propylene. These are combined in various proportions with salt, chlorine, formaldehyde, nitrogen, air or various other chemicals to produce the required properties.

### POLYOLEFIN

A family of hydrocarbons with carbon to carbon bonds. Polyethylene and polypropylene are both polyolefins.

### POLYETHYLENE

A thermoplastic material composed of polymers of ethylene (a polyolefin). Commonly shortened to 'polythene' or 'PE'.

### PVC -- Poly vinyl chloride

Chemically similar to polyethylene, except one of the hydrogen atoms from each molecule has been replaced by a chlorine atom. The basic raw material is acetylene or ethylene gas.

### POLYPROPYLENE

Polypropylene is made by the polymerization of high-purity propylene gas (a polyolefin) in the presence of an organometallic catalyst at relatively low pressures and temperatures. Commonly shortened to 'PP'.

### EVA -- Ethylene-vinyl acetate.

A high molecular weight copolymer of ethylene and vinyl acetate. (\* Note: Ethylene-vinyl alcohol is EVOH, not EVA).

## MOLECULAR STRUCTURE OF POLYMERS

**LINEAR:** long chains of molecules without appendages.

**BRANCHED:** Appendages branch from the molecular chains in three dimensions. These side chains permit greater interlocking.

**CROSSLINKED:** chains with chemical links between adjacent chains. Crosslinking restricts movement between chains therefore the polymer is usually not thermoplastic.

### SHRINK FILM

Is made from crosslinked polymer and usually 'prestressed'. When heated it tries to return to its original dimensions.

## FILM PRODUCTION METHODS

### CASTING

The casting of film involves dissolving of plastics granules or powder, plasticizer, colourants or other additives in a suitable solvent. The solution is poured onto a stainless steel belt and the solvents evaporated by application of heat. The film deposit left on the belt is stripped away and wound on a take-up roller.

### BLOWN FILM EXTRUSION

The molten plastic is forced out of an adjustable circular die opening, forming a tube. Air is forced into this extruded tube expanding it to the desired diameter. This blow helps regulate the film thickness. The air expanded tube may be wound onto take-up rollers or split and wound as flat film.

various manufacturing techniques) 3. Heat sealable --generally coated on one or both sides. Better water vapour barrier, stiffness and low temperature performance than cast or non-equally oriented PP.

### Non-equally oriented Polypropylene

Highly balanced in one direction, usually transverse, and maybe some orientation in the other direction.)

Non-equally oriented types: 1. Heat set 2. Heat sealable (a) extrusion coated or co-extruded (b) lacquer or emulsion coated.

### APPLICATIONS

**HEAT SET:** Used in combined laminated structures with cellophane or paper for snack packaging; with polyethylene and cellophane for cheeses, meats, coffee. Balanced films are preferred for better durability etc.

**BARRIER COATED HEAT SET ORIENTED PP:** has all the properties of other oriented PP films plus excellent gas barrier, moisture barrier and heat sealing properties. Extrusion coated with polyethylene or ethylene vinyl acetate copolymers it provides an excellent structure for gas flush or vacuum packaging.

### EVA -- Ethylene-vinyl acetate

EVA is slightly more expensive than LDPE and a poorer barrier to moisture, oxygen and most solvents.

**PROPERTIES:** Outstanding impact strength (especially at low temperatures), a wide heat sealing range, resilience, softness, flexibility, resistance to flex and stress cracking, excellent clarity, printability and resistance to weathering. Its resilience is not achieved with plasticizers therefore it has no plasticizer migration problems.

**APPLICATIONS:** Skin packaging (usually co-extruded with polyethylene), cling and stretch foodwrap films.

## PLASTIC FILM COMPARISON

### LOW DENSITY POLYETHYLENE (LDPE)

LDPE is amorphous and has branched polymer chains. It has a crystallinity of about 60 - 70 % It has greater impact strength, elongation, flexibility and transparency than HDPE.

**Applications:** mostly bag making because it is most readily heat sealed, has optimum balance of impact strength and clarity, superior properties at low temperatures, and is lowest cost. Ideal for high volume industrial packaging, and shrink wrapping of pallets loads.

### HIGH DENSITY POLYETHYLENE (HDPE)

HDPE is more crystalline and has linear polymer chains. It has a crystallinity of 75 - 95% It has greater stiffness, tensile strength and creep resistance; and higher softening and melting points than LDPE, therefore it has a higher minimum heat sealing temperature. Blown HDPE is normally translucent not transparent. Cast HDPE has better clarity and superior grease resistance.

**Applications:** used for speciality laminations where the packaging product is subjected to high heat.

### POLYPROPYLENE

Cast PP has no shrinking properties. It has high stiffness and therefore excellent machineability. It has outstanding optics -- transmission of colour without distortion, high gloss and sparkle. The gloss level is approximately 30% greater than polyethylene. It is strong, static free, scuff resistant, has excellent thermal resistance, receptivity to printing, and long shelf life (lack of yellowing and brittling on aging). Ideal for slow turnover products and for self service displays.

**APPLICATIONS:** soft goods, shirts, hosiery, bag packing of breads and rolls, twist wrapping of confectionery, bagging of lightweight vegetables - lettuces, spinach, mushrooms etc.

### POLYPROPYLENE TYPES

**HOMOPOLYMER:** Greater stiffness. Ideal where machinability is important, but more brittle at low temperatures and has a narrower heat sealing range than copolymer PP. Ideal for cards, stationery, hosiery, specialty hand wraps of fruits and gift baskets.

**COPOLYMER:** Used for side weld bags because of its excellent heat sealability over a wide temperature range. Shrinkable PP films are usually based on copolymers and are generally balanced. Ideal for packaging toys, records etc.

### ORIENTED POLYPROPYLENE

Stretching the film during manufacture produces orientation of the molecular structure. Improves machinability and low temperature performance. Ideal for cellophane type uses. Some films are used for shrink packaging. It cannot be converted into side weld or envelope bags because sealing temperatures required alter film's orientation and radically change its overall properties.

**PROPERTIES:** Excellent durability, dimensional stability, low water vapour transmission, exceptional flex crack resistance, outstanding clarity, favourable economics.

**APPLICATIONS:** Used for snack foods, biscuits, tobacco, cheeses etc.

The major distinctions between polypropylene films are the degree and type of orientation.

### Balanced orientation Polypropylene

Highly oriented in both directions, machine and transverse.

Balanced types:

1. Shrink 2. Heat set (stabilized against thermal dimensional changes through

