SolutionPartner

LG Polyolefin Elastomer

2008. 10. 23

LG Chem / Tech Center PO Team

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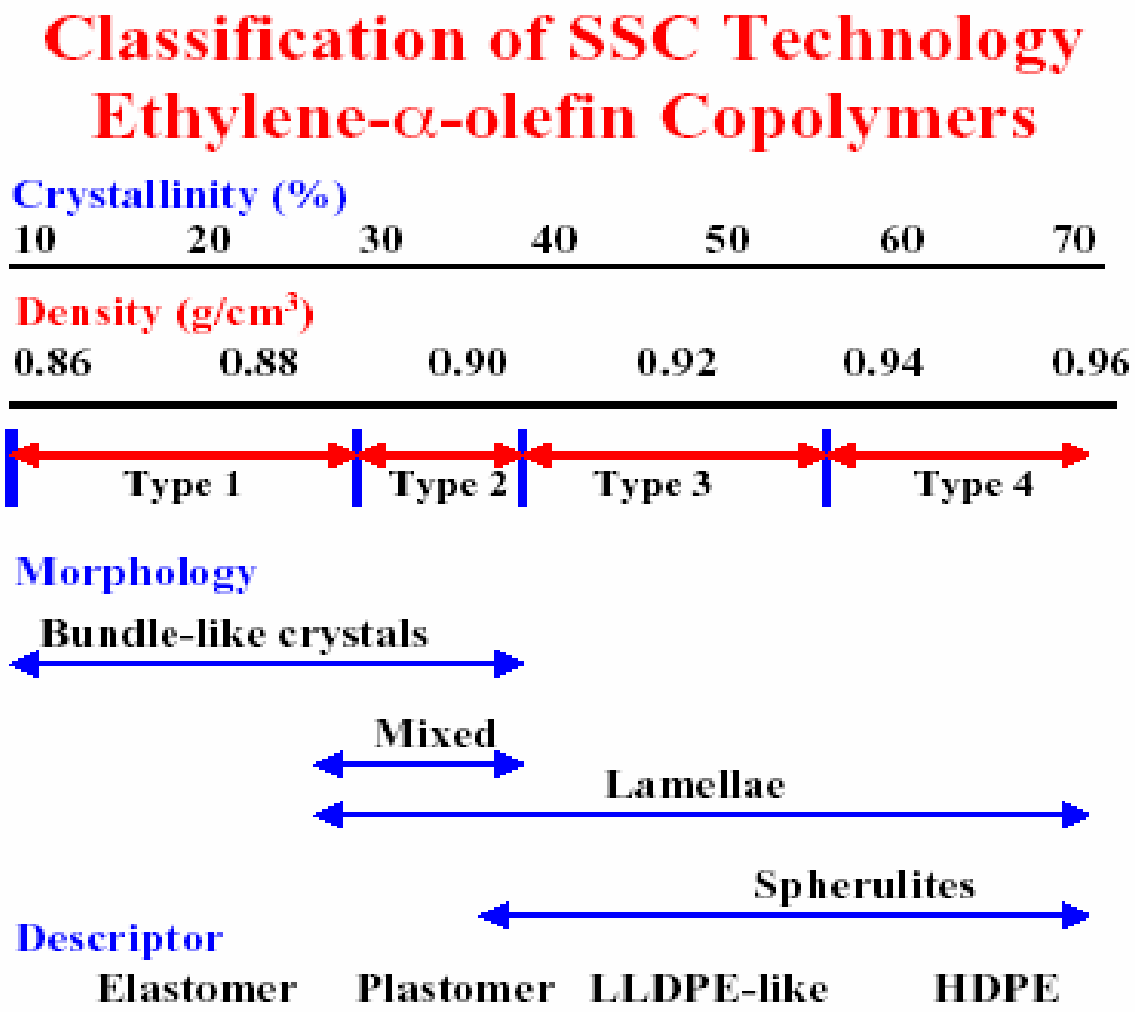
Background

- **Metallocene-based elastomers & plastomers were commercialized in 1991 by Exxon Chemical Company followed shortly thereafter by The Dow Chemical Company.**
- **Traditionally the term “Elastomers” have referred to ethylene-based, metallocene-catalyzed polymers having densities less than 0.885 g/cm3. They are used in (1) polymer modification, (2) wire & cable, (3) foams, and other applications.**
- **Traditionally the term “Plastomers” have referred to ethylene-based polymers with densities between 0.885 and 0.905 g/cm3. They are used primarily in film applications for (1) food packaging, (2) non-food packaging, and (3) stretch film.**
- **There are also metallocene-based ethylene-propylene elastomers (EPDM) that were commercialized in the late 1990s.**
- **As a result of technological advancements, recently propylene based elastomers & plastomers have been commercialized that compete with ethylene-based polymers as well as other flexible polymers.**

POE Classification



S.P. Chum, C.I. Kao, G. W. Knight; Ch 12; Metallocene-Based Polyolefins, J. Scheirs, W. Kaminsky, eds.

Commercial Products

- **Dow Chemical Co./DuPont Dow Elastomers***
  - **Ethylene Elastomers: AFFINITY™, ENGAGE®**
  - **Ethylene Propylene Elastomers: NORDEL®**
  - **Propylene Plastomers: VERSIFY™**

- **ExxonMobil Chemical Co./DEX Plastomers**
  - **Ethylene Elastomers: EXACT™**
  - **Ethylene Propylene Elastomers: VISTALON®**
  - **Propylene Plastomers: VISTAMAXX™**

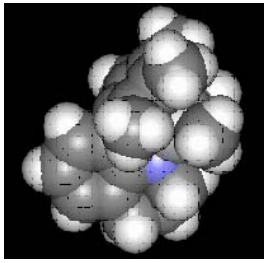
- **Mitsui Chemical**
  - **Ethylene Elastomers: TAFMER® A & P**
  - **Propylene Elastomers: TAFMER® XM**

- **LG Chem**
  - **Ethylene Elastomers: SEETEC® POE**

LG Polyolefin Elastomer

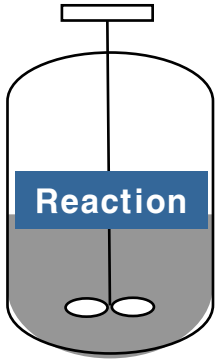
LG Ethylene Elastomers are produced by optimum combination of our unique single-site catalyst and solution process technologies.

1.Catalyst



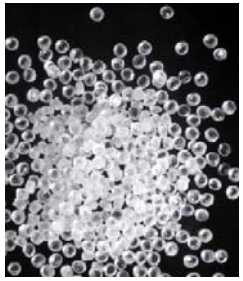
- Unique Structure
- Excellent Co-monomer Incorporation

2.Process



- High Temp.
- Process Retrofitting

3.Product



- Density Window (0.855~0.910)
- Elastic & Transparent

4. Application

Automotive Exterior/Interior

Packaging

Footwear Midsole

LG Polyolefin Elastomer – Base Resin Properties

LG POEs have lower crystallinity and lower melting point compared to other products with similar density.

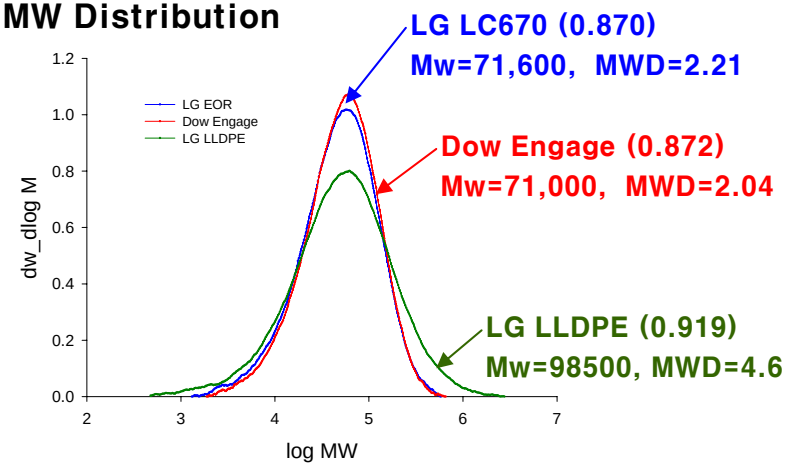
Properties \ Grade			EOR					EBR		
			LC670	Engage 8200	Exact 5371	LC170	Engage 8150	LC575	Engage 7340	Tarfmer DF610
Density	g/㎤	ASTM D-1505	0.870	0.872	0.870	0.871	0.868	0.875	0.877	0.866
Melt Index	dg/min	ASTM D-1238	4.42	4.80	4.71	0.75	0.44	5.53	4.86	1.21
Melting Temp.,	℃	(10℃/min)	57	65	61	56	59	56	63	37
Mw/Mn	-	GPC	2.2	2.0	2.0	2.2	2.1	2.4	2.0	1.9
Hardness (Shore A)	-	ASTM D-2240	68	69	69	71	70	70	72	50
Tensile Strength	kg/㎠	ASTM D-638	52	62	48	92	99	33	54	19
Flexural Modulus (1% Second)	kg/㎠	ASTM D-790	150	137	151	163	169	183	171	72

LG Polyolefin Elastomer – LC670 Properites

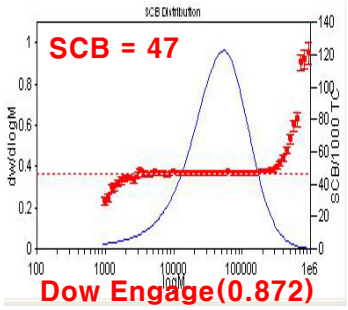
LC670 Grade shows similar physical and rheological properties compared to Dow's Engage with similar density.

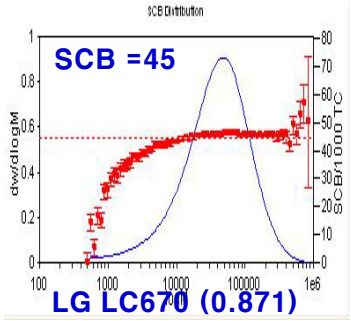
Physical Property

MW Distribution

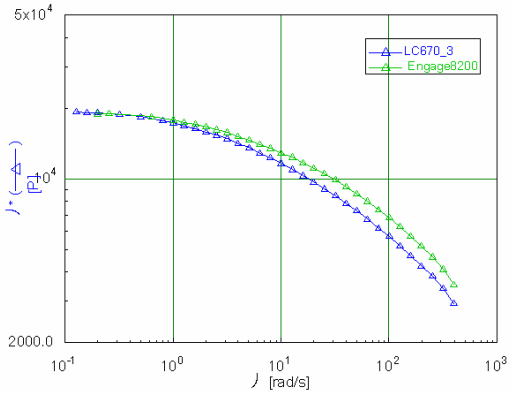


Comonomer Distribution

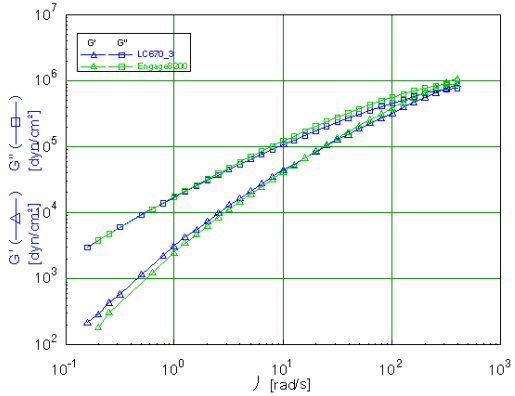




Rheological Property



Storage Modulus →



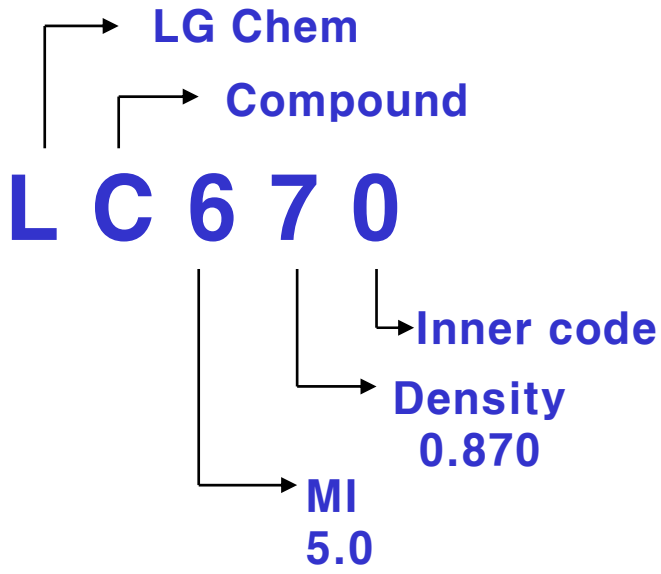
LC670 Compound shows similar physical and mechanical properties compared to competitor's compounds.

Properties \ Grade			EOR					EBR		
			LC670	Engage 8200	Exact 5371	LC170	Engage 8150	LC575	Engage 7340	Tarfmer DF610
POE Density		g/㎤	0.870	0.872	0.870	0.871	0.868	0.875	0.877	0.866
POE MI(2.16)		g/10min	4.42	4.80	4.71	0.75	0.44	5.53	4.86	1.21
Compound MI		g/10min	33.4	34.0	33.1	28.3	26.2	34.0	33.5	29.5
Tensile strength		㎏/㎠	174	174	172	169	166	171	176	168
Flexural strength		㎏/㎠	251	248	245	236	237	240	249	241
Flexural modulus		㎏/㎠	12,747	12,623	12,344	11,933	12,262	11,998	12,688	12,500
Impact strength (Izod)	23 ℃	㎏m/m	52.6	53.3	55.0	53.7	58.1	44.0	44.1	50.9
	-30 ℃	㎏m/m	4.4	4.2	4.4	4.5	4.9	3.8	3.8	5.6
Shrinkage		1/1000	8.0	7.5	8.1	8.5	8.4	8.2	8.0	7.2

1. Compound Recipe: PP(MI 52 g/10min): 67%, PE Elastomer: 17%, Others 16%
2. Compounding Extruder : Leistritz STS40HS Extruder
3. Injection : LG 100 Ton

Grade Name : LC670

- Engage 8200 Target
- MI 5.0, Den 0.870



.1st Character : LG Chem

.2nd Character : Application

C : Compound , T : T-Die coating & Lamination, F : Film

.3rd Figure : Melt Index

.4th Figure : Density

.5th Figure : Inner Code(Additives, Comonomers etc.)

LG Polyolefin Elastomer Grade

Item	LG			Dow			Exxon			
	Grade	MI	Den	GRADE	MI	Den	GRADE	Den	MI (190)	MI (230)
EOR	LC150	1.0	0.857	8842	1.0	0.857	5062	0.860	0.5	
	LC160	0.5	0.863	8180	0.5	0.863	5361	0.860	3.0	
	LC161	0.5	0.868	8130/8137	13	0.864	5061	0.868	0.5	
	LC162	1.0	<0.865	8150/8157	0.5	0.868	5171	0.870	1.0	
	LC170	1.0	0.870	8100/8107	1.0	0.870				
	LC670	5.0	0.870	8200/8207	5.0	0.870	5371	0.870	5.0	
	LC370	3.0	0.870	8400/8407	30	0.870	5181	0.882	1.1	
	LC371	1.0	0.875	8452	3.0	0.875	8201	0.882	1.1	
				8411	18	0.880	8203	0.882	3.0	
	LC180	1.0	0.885	8003	1.0	0.885	8210	0.882	10	
				8401	30	0.885	8230	0.882	30	
	LC190	1.5	0.897	8440	1.6	0.897	0201	0.902	1.1	
				8402	30	0.902	0203	0.902	3.0	
	LC100	1.0	0.903	8480	1.0	0.902	Mitsui			
				8450	3.0	0.902				
				8540	1.0	0.908	GRADE	Den	MI (190)	MI (230)
				8445	3.5	0.910				
EBR				7467	1.2	0.862	DF605	0.862	0.5	0.9
	LC165	5.0	0.865	7447	5.0	0.865	DF610	0.862	1.2	2.2
	LC175	0.5	0.875	7370	0.5	0.875	DF640	0.862	3.6	6.7
	LC575	5.0	0.875	7340	5.0	0.875	DF6350	0.864	35	65
				7380/7387	<0.5	0.870	DF740	0.870	3.6	6.7
				7270/7277	0.8	0.880	DF7350	0.862	35	-
				7256	2.0	0.885	DF805	0.885	0.8	0.9
				7086	<0.5	0.901	DF810	0.885	1.2	2.2
							DF840	0.885	3.6	6.7
							DF910	0.893	1.2	2.2
							DF940	0.893	3.6	6.7
							DF110	0.905	1.2	2.2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