

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

OMEGA LINER COMPANY, INC.,
Petitioner,

v.

BUERGOFOL GMBH,
Patent Owner.

Case No. IPR2023-01372
Patent No. 9,657,882

DECLARATION OF MACAULAY RUSH

Omega Exhibit 1073 Omega v. Buergofol GmbH IPR2023-01372
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I, MacAulay S. Rush, declare:

1. I am a paralegal with Wolf, Greenfield & Sacks, P.C. I have personal knowledge of the facts set forth below and if called as a witness I could and would testify competently thereto.

2. On October 18, 2024, I visited the webpage associated with the following URL:

https://www.matweb.com/search/datasheet_print.aspx?matguid=b743d35d2c4b4d4da2864e128b8f21ba. I printed a screenshot of this webpage and saved it as a PDF image. The PDF image of this webpage as it appeared on October 18, 2024 is attached as Exhibit A to this Declaration.

3. The information depicted in Exhibit A is the same as provided in Petitioner Exhibit 1047 filed with the Petitioner's Reply filed on October 7, 2024.

4. On October 18, 2024, I visited the webpage associated with the following URL: <https://www.yumpu.com/en/document/view/10129934/durethanr-c-38-f-series-lanxess#>. I downloaded a copy of the ePaper and saved it as a PDF. The PDF of the ePaper is attached as Exhibit B to this Declaration.

5. The information depicted in Exhibit B is the same as provided in Petitioner Exhibit 1048 filed with the Petitioner's Reply filed on October 7, 2024.

6. On October 18, 2024, I visited the webpage associated with the following URL:

https://www.matweb.com/search/datasheet_print.aspx?matguid=f1e36ee80e74408caa8eaa023ca5af0b. I printed a screenshot of this webpage and saved it as a PDF

image. The PDF image of this webpage as it appeared on October 18, 2024 is attached as Exhibit C to this Declaration.

7. The information depicted in Exhibit C is the same as provided in Petitioner Exhibit 1049 filed with the Petitioner's Reply filed on October 7, 2024.

8. On October 21, 2024, I obtained a copy of the Product Information Sheet for Constab PE-SA 270 from the record of the co-pending District Court Litigation, *Buergofol GmbH v. Omega Liner Company, Inc.*, Case No. 22-cv-04112-KES (D. S.D.), as produced by Patent Owner on August 24, 2024 and designated as Bates No. BF2014. A copy of the document is attached as Exhibit D to this Declaration.

9. The information depicted in Exhibit D is the same as provided in Petitioner Exhibit 1051 filed with the Petitioner's Reply filed on October 7, 2024.

I declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like are punishable by fine, imprisonment, or both, under Section 1001 of Title 18 of the U.S. Code.

I declare under penalty of perjury that the foregoing is true and correct.

Respectfully submitted,

Dated: October 21, 2024

/MacAulay S. Rush/
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EXHIBIT A

Lanxess Durethan® C 38 F 000000 Copolyamide (Unverified Data)****Categories:** [Polymer](#); [Thermoplastic](#); [Nylon \(Polyamide PA\)](#); [Nylon 6 \(PA6\)](#)**Material Notes:** PA 6-Copolymer, non-reinforced, extrusion, medium viscosity, no additives, high transparency**Vendors:** No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	1.13 g/cc	0.0408 lb/in ³	ISO 1183
Water Absorption	10 %	10 %	Test Sim. to ISO 62
Moisture Absorption at Equilibrium	3.0 %	3.0 %	23°C/50% R.H.; Test Sim. to ISO 62
Viscosity Number	190 cm ³ /g	1.90 dl/g	ISO 307, 1157, 1628
Melt Flow	6 g/10 min @Load 2.16 kg, Temperature 235 °C	6 g/10 min @Load 4.76 lb, Temperature 455 °F	Estimated using room temperature density; ISO 1133

Electrical Properties	Metric	English	Comments
Volume Resistivity	1.00e+13 ohm-cm	1.00e+13 ohm-cm	Conditioned; IEC 60093
Surface Resistance	1.00e+11 ohm	1.00e+11 ohm	IEC 60093
Dielectric Constant	3.0 @Frequency 1e+6 Hz	3.0 @Frequency 1e+6 Hz	Conditioned; IEC 60250
Dielectric Strength	30.0 kV/mm	762 kV/in	Conditioned; IEC 60243-1

Thermal Properties	Metric	English	Comments
Melting Point	212 °C	414 °F	10°C/min; ISO 11357-1/-3

Descriptive Properties

Form	Pellets
ISO Short Name	ISO 1874-PA 6/IPDI,FT,18-020
Processing	Film extrusion
Region	Asia Pacific Europe Near East/Africa North America South and Central America

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EXHIBIT B

Durethan® C 38 F series

- Co-polyamides for the production of PA/PE composites by blown film coextrusion
- High transparency
- Good thermoforming properties
- Non-nucleated grades for the embedded central layer of PA for use in blown film Coextrusion (C 38 F, C 38 FA, C 38 FAM)
- Nucleated and lubricated grades for the outer layer of PA in blown film Coextrusion (C 38 FKS and C 38 FKAM)

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1 Product description

The products in the Durethan C 38 series are co-polyamides that have been specially developed for blown-film coextrusion. They satisfy the differing requirements made on the processing properties of the material and the final film. Every single batch of LANXESS film products is subjected to stringent quality control. This guarantees an exceptionally high degree of purity that is indicated by the letter "F" in the product name.

2 Film grades

The Durethan C film grades possess the typical properties of polyamide, such as a high abrasion resistance and toughness while displaying a high tensile strength and strain. As with all polyamide films, those in Durethan C 38 F have a very good barrier effect against oxygen, nitrogen, carbon dioxide and aroma substances which is important for food packaging applications. These grades comply with the common food contact regulations. For more detailed information see www.durethan.com.

2.1 Durethan C 38 F

Durethan C 38 F is a medium-viscosity co-polyamide which does not contain any additives or processing aids. The high transparency and good thermoforming properties of Durethan C 38 F mean that it is used preferentially for embedded PA layers in multi-layer blown film coextrusion, such as in PE-x-PA-x-PE composite films (x = tie layer). With Durethan C 38 F as the embedded central layer, it is also possible to produce blown films in greater thicknesses and with greater transparency than when general-purpose PA 6/66 co-polyamides are used.

Co-extruded blown film produced with Durethan C 38 F generally displays good, uniform thermoforming behavior, without any thin points in the machine direction, as can sometimes occur with PA-PE flat film composites.

2.2 Durethan C 38 FA

Durethan C 38 FA is a lubricated Durethan C 38 F with particularly good adhesion and sliding friction properties (A = lubricant). Films made from Durethan C 38 FA are slightly more supple and have better surface slip properties than similar films made from Durethan C 38 F.

Moreover the processing aid (A) improves the flow properties of the granules and their processing properties overall. Durethan C 38 FA can be conveyed in a stable manner at high screw speeds and can be processed with a lower drive power than the non-lubricated Durethan C 38 F.

The problems that are sometimes encountered in the extrusion of non-lubricated PA granules at higher screw speeds, in the form of bubble formation and hence holes in the film due to entrapped air, have not so far been seen with Durethan C 38 FA. Like

Durethan C 38 F, Durethan C 38 FA is used primarily for the embedded PA layer of multi-layer co-extruded blown film. In terms of transparency and thermoforming properties, Durethan C 38 FA and C 38 F do hardly differ from each other.

In contrast to Durethan C 38 F, Durethan C 38 FA is also the material of choice for thicker PA outer layers on asymmetric PA-PE co-extruded blown film in thicknesses of 35 µm and above. Smooth passage through the machine (i.e. stick-slip properties) can be considerably improved through efficiently-coordinated conditioning (see section on "Processing").

2.3 Durethan C 38 FAM

In addition to lubricant "A", Durethan C 38 FAM also contains the particularly effective additive "M", which gives the polyamide especially high flexibility. As an embedded layer in an application-ready state, the films achieve a level of softness that is otherwise only possible with well conditioned films. Films with C 38 FAM are thus highly suitable for thermoforming, in which process they stand out due to their particularly high drawing ratios and even stretching.

With regard to other properties and applications the product corresponds to C 38 FA.

2.4 Durethan C 38 FKS

Durethan C 38 FKS is a nucleated and lubricated Durethan C 38 F used preferentially for the PA outer layer of asymmetric PA-PE co-extruded blown film. The nucleation leads to controlled crystallization with fine spherulite formulation in the PA layer. This produces what is generally a permanent increase in both the temperature resistance for welding and the stick-slip properties for smooth passage through the machine. The non-nucleated co-polyamides of Durethan C 38 F can lead to blockages and cause sticking problems on the sealing tool with thin PA outer layers of less than 35 µm on account of their low tendency to crystallize.

2.5 Durethan C 38 FKAM

Durethan C 38 FKAM is a nucleated Durethan C 38 F which contains a special lubricant additive to give even better stick-slip properties than Durethan C 38 FKS for the PA outer layer of co-extruded blown films (see Table 2). The additional lubricant means that PA-PE composite films produced with Durethan C 38 FKAM are somewhat more flexible

and smoother than those incorporating Durethan C 38 FKS. Moreover these films mostly show a better curl behavior.

In the Gelbo-flex test and the puncture strength test, films in Durethan C 38 FKAM generally display somewhat better results than films produced in the other Durethan C 38 F products.

3 Delivery form and storage

Durethan C 38 F products are supplied dry and ready to process in the form of cylindrical granules. The packaging is moisture-tight and – depending on the type of packaging (bags, octabins, silo) – guarantees a shelf life of at least 4 respectively 12 months, provided the containers are neither opened nor damaged. The containers should be stored in a dry and frost-free place. Material that has been stored at a low temperature, such as in unheated storage rooms, must be warmed up to room temperature prior to processing in order to prevent processing problems such as the condensation of moisture on the granules and other irregularities caused by excessive cooling.

4 Processing advice

Durethan C 38 F products are supplied dry and ready to process. Normally it will not be necessary to pre-dry the granules. Standard single-screw extruders can be used for film extrusion. Of the different screw designs available, single-flighted three-section screws with a relatively flat cut and a length of 24 to 28 D have proved successful (Table 1).

The screws that have been developed more recently, with shearing and mixing sections, frequently offer a better performance than conventional three-section screws. These so-called SM screws generally ensure highly effective plastication, including at high output rates. Machine builders currently have state-of-the-art CAD concepts at their disposal for designing screws for polyamide following specification of the raw material data, such as viscosity curves with the melt viscosity (Pa·s) plotted against the shear rate (s⁻¹), and the standard processing temperatures (see Fig. 1). Experience has shown that the best melt temperature is between 240 and 255 °C. The optimum processing temperature is ultimately determined by the appearance and stability of the melt. If orange-peel-like marks develop in

certain sections of the PA layer in the machine direction, then this will generally be because the film-blowing die is too cold at this point, leading to partial freezing phenomena in the PA melt channel. The individual heating zones should have reached the processing temperature roughly half an hour before the unit is started up. A successful approach in practice is to start with processing temperatures that are approximately 10 °C higher in order to minimize the danger of the screw or die being damaged during start-up. To ensure better homogenization of the melt and reinforce the necessary pressure build-up it is recommended that screen packs be incorporated between the end of the screw and the die connection.

The following screen packs have proved successful:

- 2 coarse supporting screens with 100 to 256 meshes/cm² (or 25 to 40 meshes/inch)
- 3 fine screens with 2500 to 4900 meshes/cm² (or 120 to 180 meshes/inch)

Care must be taken to ensure that the moisture content of the granules to be processed does not increase through absorption of moisture from the air, otherwise processing problems may result. The moisture content upon delivery is max. 0.06 %, so the granules should not therefore be left in the open hopper for more than an hour.

Tried-and-tested screws

Screw diameter D [mm]	45	60	90
Flight depth delivery section [mm]	1.8 ... 2.0	2.4 ... 2.6	3.0 ... 3.2
Compression			
Flight depth delivery section to flight depth feed section	1:3.6 ... 1:4.0	1:3.6 ... 1:4.0	1:3.8 ... 1:4.2
Selection break down	Feed section	Compression section	Delivery section
Screw length L = 24 ... 28 D	0.3 ... 0.4 L	0.2 ... 0.25 L	0.4 ... 0.5 L

Table 1 Tried-and-tested screws

When Durethan C 38 F products are processed by blown film coextrusion, particular attention should be paid to a streamlined design of the multi-layer blowing head in order to ensure an optically flawless film. Experience has shown that the die gap on the annular die is best set at between 0.4 and 0.6 mm for PA. Score marks running in the machine direction of the film are almost always due to deposits in the die gap. This is why this part of the blowing head should be checked very carefully prior to production in each case, and cleaned where necessary. The coextrusion blown film die ought to be easily to dismantle, in order to permit cleaning of the die gap.

With asymmetric PA-PE co-extruded blown film incorporating PA in the outer layer, which is generally cooled with air, the film often displays an undesirable tendency to curl towards the inside of the tube (= PE sealing side), even when use is made of Durethan C 38 F co-polyamides, such as Durethan C 38 FKS and C 38 FKAM for PA thicknesses of up to 35 µm or C 38 FA for PA layers with a layer thickness in excess of 35 µm.

"Inline" conditioning (= moistening) of the composite tubular PA-PE film has proved a successful means of reducing this tendency to curl – either in a continuous process employing a hot water bath at 50 to 60 °C, with a residence time of 3 to 7 s, or through steam treatment. Since water has a higher surface tension, at 69 mN/m, than PA film, at 52 to 54 mN/m, a surfactant must be added to the water batch in order to achieve uniform humidification without the formation of water droplets. If no industrial (non-foaming) surfactants are available, standard washing-up liquid can be used (approximately 1 liter per 100 liter water bath).

Conditioning the outer PA layer of PA-PE co-extruded blown film brings about a long-term improvement in key properties of the film:

- Reduced tendency to curl
- Smoother passage through the machine
- Better resistance to buckling fracture
- Better dimensional stability
- Improved softness and suppleness

Conditioning with warm water or steam primarily triggers post-crystallization and hence shrinkage in the co-polyamide outer layer, which leads to a reduction in, or even a reversal of, the tendency to curl.

The optimum conditioning configuration must be established for each individual composite film thickness. The PA outer layer additionally requires moisture in order to obtain the typical properties of PA. An excessively dry PA outer layer, which will inevitably result in co-extruded PA-PE blown film without controlled "inline" conditioning, frequently leads to an increased tendency to buckling fracture in vacuum packaging. The PA film requires a moisture content of 2.5 to 2.8 %, which corresponds to the equilibrium state in a standard climate, by way of a natural "plasticizer".

A simple sealing test can be performed in order to check whether the PA layer has absorbed too much moisture or not. The seal seam must not display any moisture bubbles in the PA layer. If there are moisture bubbles, then the intensity of the conditioning must be reduced, e.g. by shortening the exposure/immersion time or by reducing the temperature of the water bath. If conditioning is to be performed in a water bath, then the distance from the immersion bath to the winder should be as long as possible in order to give the film sufficient time to dry. It may be necessary to use a hot air shower (< 80 °C) to dry the surface of the film. The PA side of the film may not contain any surplus or perceptible surface moisture at the winder and under no circumstances should a wedge of water form in the winding gap,

since this would result in optical defects (water marks) on the film.

With symmetric co-extruded blown film, such as PE-x-PA-x-PE or PE-x-PA-EVOH-PA-x-PE composites (x = tie layer), it is not possible, or indeed necessary, to condition the embedded PA layer(s), because these layers are embedded in the dry state between two layers of PE. They are less prone to buckling fracture in this position and are also protected against mechanical damage. This means that composite films with an embedded PA layer offer greater gas barrier security and a clearly improved resistance to buckling fracture than asymmetric PA-PE composite films with an outer layer of PA. The best material to use for the embedded PA layers is the non-nucleated co-polyamide, Durethan C 38 F (see Fig. 2).

Experience has shown that the PE partner products in blown film coextrusion with Durethan C 38 F fall within an MFI range (190 °C/2.16 kg) of approximately 0.3 to 2.6 g/(10 min) while the coupling agent products come within an MFI range of some 3 to 5 g/(10 min).

5 Recycling

Single-sort films of this type which do not contain any harmful substances can be mechanically recycled after use. Films containing harmful substances can be chemically or thermally recycled. Parts should be marked in accordance with DIN ISO 11469. The identification mark for films of this type is as follows:

>PA 6/IPDI<

6 Viscosity curves

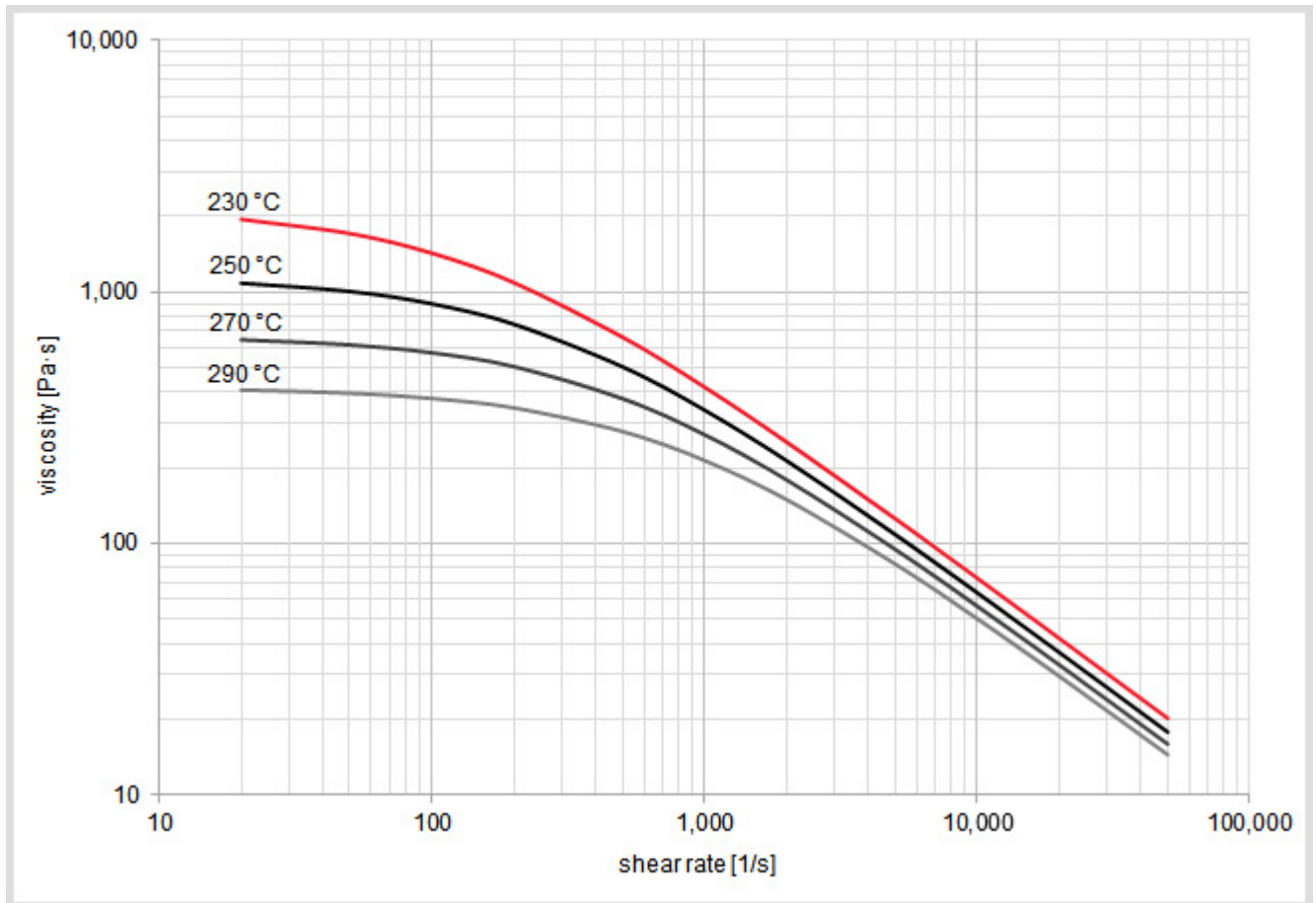


Fig. 1 Melt viscosity curves Durethan C 38 F (valid for all variation of the C 38 F series)

7 Reference data, film properties for Durethan C 38 F series

Properties	Test condition	Units	Standards	C 38 F	C 38 FA C 38 FAM	C 38 FKS	C 38 FKAM
Melting temperature		°C	ISO 11357-1, -3	212	212	212	212
Viscosity number		cm ³ /g	ISO 307	190	190	190	190
Thermal conductivity		W/(m·K)	ISO 8302	0.2	0.2	0.2	0.2
Specific heat		kJ/(kg·K)		1.5	1.5	1.5	1.5
Density		kg/m ³	ISO 1183	1130	1130	1130	1130
Film properties							
Static + slide friction ¹			DIN 53375				
Film vs. film	μ stat			0.6		0.39	0.36
	μ dyn			0.36		0.36	0.22
Film vs. steel	μ stat			0.2		0.19	0.18
	μ dyn			0.16		0.17	0.15
Tensile test on mono cast film (m.d.) ²							
Young's modulus		MPa	ISO 527	1200	1200	1200	1200
Yield stress		MPa	ISO 527	40	40	40	40
Yield strain		%	ISO 527	5	5	5	5
Stress at break		%	ISO 527	300 ... 400	300 ... 400	300 ... 400	300 ... 400
Strain at break		MPa	ISO 527	70	70	70	70
Gas permeability at 23 °C, layer 25 μm ²							
Oxygen (O ₂) ²	at 0 % r.h.	$\frac{\text{cm}^3}{\text{m}^2 \cdot \text{d} \cdot \text{bar}}$	DIN 53380	60 ... 70	60 ... 70	60 ... 70	60 ... 70
	at 50 % r.h.			30 ... 40	30 ... 40	30 ... 40	30 ... 40
	at 90 % r.h.			110 ... 120	110 ... 120	110 ... 120	110 ... 120
Carbon dioxide (CO ₂) ²	at 0 % r.h.	$\frac{\text{cm}^3}{\text{m}^2 \cdot \text{d} \cdot \text{bar}}$	DIN 53380	230 ... 280	230 ... 280	230 ... 280	230 ... 280
Nitrogen (N ₂) ²	at 0 % r.h.	$\frac{\text{cm}^3}{\text{m}^2 \cdot \text{d} \cdot \text{bar}}$	DIN 53380	10 ... 12	10 ... 12	10 ... 12	10 ... 12
Water vapor 25 μm film	at 85 % r.h.	$\frac{\text{g}}{\text{m}^2 \cdot \text{d}}$	DIN 53122	40 ... 50	40 ... 50	40 ... 50	40 ... 50

r.h. = relative humidity

¹ measured on PA-x-PE blown coex film (30-10-50 μm) air-cooled and in-line water bath conditioned at 50 °C PA outer layer 30 μm

² measured on 50 μm mono-cast film, manufactured at 90 °C chill roll temperature

Table 2 Reference data, film properties Durethan C 38 F series

8 Recommendations for the selection of grades

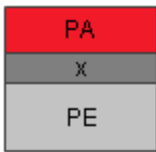
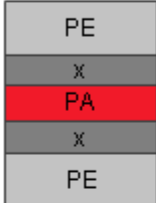
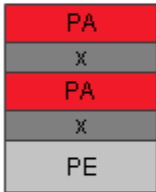
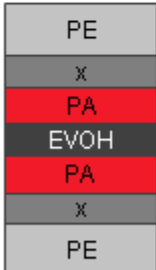
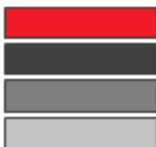
A: Asymmetric PA-x-PE three-layer blown film		
	PA layer < 35 µm:	Durethan C 38 FKS or C 38 FKAM
	PA layer > 35 µm:	Durethan C 38 FA or C 38 FAM
B: Symmetric PE-x-PA-x-PE five-layer blown film		
	PA layer < 25 µm:	Durethan B 40 FAM, C 38 FA or C 38 FAM
	PA layer > 25 µm:	Durethan C 38 F, C 38 FA or C 38 FAM
C: Asymmetric PA-x-PA-x-PE five-layer blown film		
	PA outer layer:	Durethan C 38 FKS or C 38 FKAM
	embedded PA layer:	Durethan C 38 F, C 38 FA or C 38 FAM
D: Symmetric PE-x-PA-EVOH-PA-PE seven-layer blown film with an EVOH barrier layer		
		Durethan C 38 F, C 38 FA or C 38 FAM
		Durethan C 38 F, C 38 FA or C 38 FAM
	= PA layer = EVOH barrier layer = Coupling agent layer = PE layer	Grade = preferential PA grade used

Fig. 2 Recommendations for Durethan grades frequently-used for composite films

This information and our technical advice - whether verbal, in writing or by way of trials - are given in good faith but without warranty, and this also applies where proprietary rights of third parties are involved. Our advice does not release you from the obligation to verify the information currently provided - especially that contained in our safety data and technical information sheets - and to test our products as to their suitability for the intended processes and uses. The application, use and processing of our products and the products manufactured by you on the basis of our technical advice are beyond our control and, therefore, entirely your own responsibility. Our products are sold in accordance with the current version of our General Conditions of Sale and Delivery.

Trial Products (grade designations beginning e.g. with the codes DP, TP, KL or KU) are sales products at the developmental stage (trial products). For this reason, no assurances can be given as to type conformity, processability, long-term performance characteristics or other production or application parameters. No definitive statements can be made regarding the behavior of the product during processing or use. The purchaser/user uses the product entirely at his own risk. The marketing and continued supply of this material are not assured and may be discontinued at any time.

EXHIBIT C

Envalior Durethan® B 40 FAM 000000 Nylon 6 (PA6), Conditioned

Categories: [Polymer](#); [Thermoplastic](#); [Nylon \(Polyamide PA\)](#); [Nylon 6 \(PA6\)](#); [Nylon 6, Unreinforced](#)

Material Notes: PA 6 film grade of high viscosity with high slip agent and lubricant content, not nucleated

Application Examples: flat and blown film with good surface slip and smoothness - including in the freshly extruded state, synthetic sausage casings, shrink bags, monofilaments

Former Lanxess product line is now with Envalior.

Vendors: No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	1.14 g/cc	0.0412 lb/in ³	ISO 1183
Moisture Absorption at Equilibrium	3.0 %	3.0 %	50% RH; ISO 62
Water Absorption at Saturation	10 %	10 %	ISO 62
Melt Flow	3.0 g/10 min @Load 2.16 kg, Temperature 235 °C	3.0 g/10 min @Load 4.76 lb, Temperature 455 °F	ISO 1133-1

Mechanical Properties	Metric	English	Comments
Ball Indentation Hardness	40.0 MPa	5800 psi	ISO 2093-1
Tensile Strength, Yield	35.0 MPa	5080 psi	50 mm/min; ISO 527-1,-2
Elongation at Break	>= 50 %	>= 50 %	50 mm/min, Nominal; ISO 527-1,-2
Elongation at Yield	25 %	25 %	50 mm/min; ISO 527-1,-2
Tensile Modulus	0.800 GPa	116 ksi	1 mm/min; ISO 527-1,-2
Flexural Yield Strength	20.0 MPa @Strain 3.5 %	2900 psi @Strain 3.5 %	2 mm/min; ISO 178-A
Flexural Modulus	0.700 GPa	102 ksi	2 mm/min; ISO 178-A
Flexural Strain at Break	8.0 %	8.0 %	2 mm/min; ISO 178-A
Izod Impact, Notched (ISO)	7.50 kJ/m ² @Temperature -30.0 °C	3.57 ft-lb/in ² @Temperature -22.0 °F	ISO 180-1A
Izod Impact, Unnotched (ISO)	NB @Temperature -30.0 °C	NB @Temperature -22.0 °F	ISO 180-1U
Charpy Impact Unnotched 	NB @Temperature 23.0 °C	NB @Temperature 73.4 °F	ISO 179-1eU
	NB @Temperature -30.0 °C	NB @Temperature -22.0 °F	ISO 179-1eU
Charpy Impact, Notched 	0.500 J/cm ² @Temperature -30.0 °C	2.38 ft-lb/in ² @Temperature -22.0 °F	ISO 179 1eA
	5.00 J/cm ² @Temperature 23.0 °C	23.8 ft-lb/in ² @Temperature 73.4 °F	ISO 179 1eA

Electrical Properties	Metric	English	Comments
Volume Resistivity	1.00e+14 ohm-cm	1.00e+14 ohm-cm	IEC 60093
Surface Resistance	1.00e+13 ohm	1.00e+13 ohm	IEC 60093
Dielectric Constant 	4.0 @Frequency 1e+6 Hz	4.0 @Frequency 1e+6 Hz	IEC 60250
	18 @Frequency 100 Hz	18 @Frequency 100 Hz	IEC 60250
Dielectric Strength	35.0 kV/mm @Thickness 1.00 mm	889 kV/in @Thickness 0.0394 in	IEC 60243-1

Thermal Properties	Metric	English	Comments
Melting Point	222 °C	432 °F	10°C/min (Dry); ISO 11357-1,-3

Processing Properties	Metric	English	Comments
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Melt Temperature	260 °C	500 °F	injection molding
Mold Temperature	40.0 °C	104 °F	injection molding

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistent format. Users requiring more precise data for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise that you only use the original value or one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's [terms of use](#) regarding this information. [Click here](#) to view all the property values for this datasheet as they were originally entered into MatWeb.

EXHIBIT D

Product Information

CONSTAB

Member of **Kafrit** Group

CONSTAB PE-SA 270 Antiblock-Slip Masterbatch

Issued: 22/03/2001
Revised: 01/10/2012

1. Product Description

CONSTAB PE-SA 270 is used for the production of general purpose plain PE-films for packaging. It creates a micro roughness as well as an antiblock additive layer on the film surface to avoid blocking during winding/unwinding of reels and during packaging operations.

- Contains CaCO_3 and a slow migration antiblock additive in PE
- Awards best antiblock properties

2. Physical Properties

Typical Properties (SI):

PROPERTY	VALUE	UNIT	METHOD
Colour	white, opaque	visual	CONSTAB
Density	1.200	g/cm ³	ISO 1183
Bulk Density	570	kg/m ³	ISO 60

3. Application

For each application the exact dosing has to be determined empirically.

PROPERTY	VALUE	UNIT	REMARK
Typical Let Down Ratio	1.0 ... 4.0	%	Gravimetric

This product will have an effect on for example welding, bonding, printing, laminating of the final film. If there is a need for further additive masterbatches please contact your local sales representative for recommendations.

4. Approvals

For detailed information please contact your local sales representative. This product is intended as a component for the production of food packaging articles according to the regulations of:

- European Union (EU)
- U.S. Food and Drug Administration (FDA)

5. Storage

The quality of this product is impaired by humidity, sunlight, temperature and further environmental influences. Therefore, opened containers must be closed carefully. The expected shelf-life is 6 months if stored properly. For further information please consult the Safety Data Sheet available via your local sales representative.

Giving Life to Plastic

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