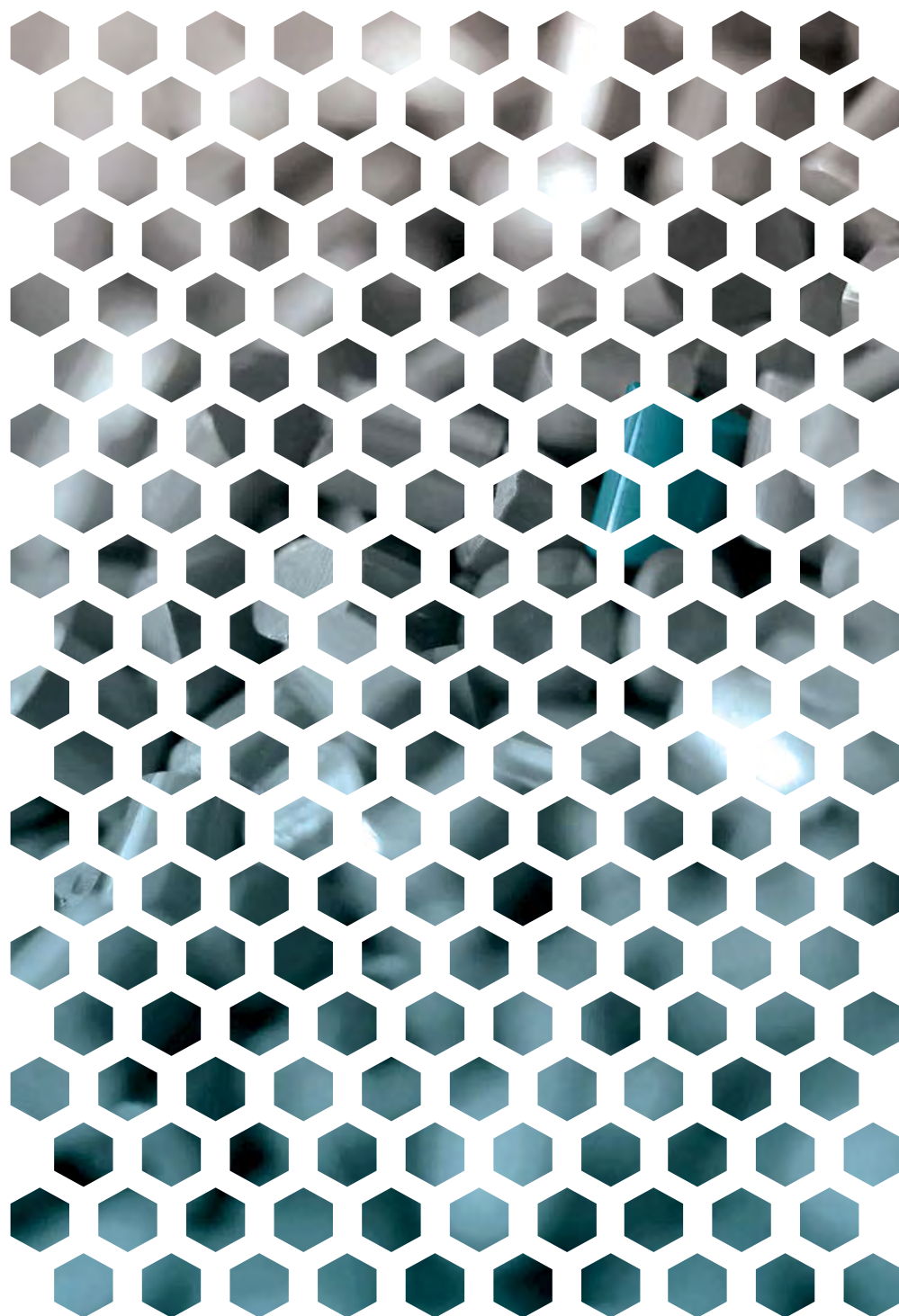




POLYAMIDES FILM GRADE



Radici Plastics has developed a Radilon® family of products specifically for extrusion and film manufacturing. The new materials meet the requirements of a market that is increasingly demanding with respect to both the final products and processing technologies.

RadiciGroup's upstream vertical integration enables full control over the design of these special materials from the very beginning, that is, from the polymerization stage at the RadiciGroup Chemicals polyamide production plants.



POLYAMIDE FUNCTIONS

In packaging film, the polyamide layer performs two crucial functions:

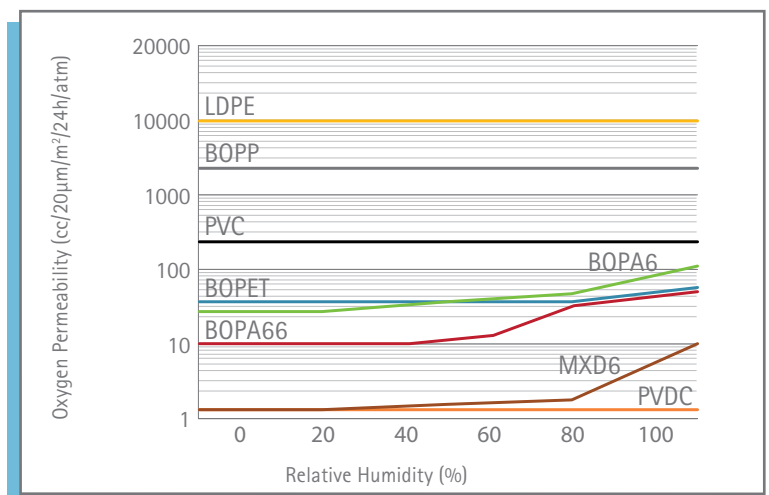
- It delays the deterioration of packaged foods by creating a barrier that considerably slows down the rate of oxygen migration into the packages.
- It reduces to a minimum the migration of food aromas from the package, thus ensuring long conservation of the food's organoleptic properties.

In film manufacturing, the polyamide layer is usually combined with layers of polythene or polythene copolymers to create a multilayer film that provides an effective seal against moisture, whilst ensuring good transparency.

Graph below shows the oxygen permeability values for a few polymers used in the manufacture of film. The gas barrier properties of polyamides are excellent, and they are even better for biaxially oriented polyamide 6 and 66.

Polyamides are used in packaging materials when characteristics in addition to good barrier properties are required, such as:

- Mechanical Strength
- Toughness
- Transparency
- Thermo-formability
- Puncture resistance
- Heat resistance



RADICI PLASTICS PRODUCT RANGE

Film-grade polyamides are sold by Radici Plastics under the Radilon® brand name. Film extrusion grades are available in a wide range of viscosities and crystallization speed, including copolyamides with different melting points.

PRODUCT RANGE

Radilon®	Polymer
Radilon® S	PA 6
Radilon® CS and CA	Copolyamides
Radilon® A	PA 6.6
Radilon® D	PA 6.10
Radilon® DT	PA 6.12

Thanks to the flexibility of its production plants, RadiciPlastics can supply its customers with specific grades that cover different needs such as:

- Products requiring different viscosity grades
- Products requiring enhanced lubrication
- Products requiring different crystallization level

Everything is done to meet the needs of the various application sectors. Furthermore, Radici Plastics is available to design tailored products for special requirements that are not covered by the products already in the current line.

RADILON® FILM GRADE PROPERTIES

PROPERTIES	METHOD	UNIT	S 32F	S 35L	S 35FL	S 40L	CS 34FL	CS 38FL	CS 38TX
Melting point	ISO 11357-1	°C	222	222	222	222	190	190	205
Viscosity Number	ISO 307	ml/g	185	200	200	245	195	230	230
Density	ISO 1183	Kg/m ³	1140	1140	1140	1140	1120	1120	1120
Moisture content	ISO	%	<0,06	<0,06	<0,06	<0,06	<0,06	<0,06	<0,06
O2 Transmission rate	23°C / 0% r.h. 50µm	ml/m ² . day.bar	26	26	26	26	24	24	-
CO2 Transmission rate	23°C / 0% r.h. 50µm	ml/m ² . day.bar	85	85	85	85	130	130	-

RADILON® FILM GRADE PROPERTIES

PROPERTIES	METHOD	UNIT	CA 27	A 42K	A 42	A 38	D 38	DT 38
Melting point	ISO 11357-1	°C	245	260	260	260	220	197/207
Viscosity Number	ISO 307	ml/g	146	260	260	230	230	230
Density	ISO 1183	Kg/m ³	1120	1140	1140	1140	1070	1060
Moisture content	ISO	%	<0,06	<0,06	<0,06	<0,06	<0,06	<0,06
O2 Transmission rate	23°C / 0% r.h. 50µm	ml/m ² . day.bar	-	26	26	26	100	90
CO2 Transmission rate	23°C / 0% r.h. 50µm	ml/m ² . day.bar	-	85	85	85	10	6

The main processes for the manufacture of packaging film are cast bi-oriented extrusion or blown extrusion. In cast extrusion, the most commonly used polyamides are Radilon® S homopolymers, for which extrusion thickness normally varies from 20 microns to 100 microns.

In this case, the choice of the right Radilon® grade for a given technology is essential, but also very important are the cooling process and the crystallization speed, which together can determine the quality of the finished film in terms of transparency and mechanical strength. In blown extrusion, products from all the Radilon® grades S, CS and A.

Generally speaking, the CS (copolyamide) grade is the preferred choice if it is to be coextruded with PE, because it gives the film enhanced transparency, better thermoformability and improved adhesion between layers.

RADILON® D

A new family of semi-crystalline polyamides 6.10 obtained from the polycondensation of 1,6-hexamethylene diamine and 1,10-decanedioic acid (sebacic acid). Sebacic acid is extracted from castor oil: a natural raw material obtained from the seeds of castor oil plant.

Radilon® D bio-based polyamide 6.10 family contains about 60% of raw material that come from renewable sources. It is compounded at various plastic production sites or alternatively used in fiber and plastic film market.



Castor oil seeds



Castor oil plant

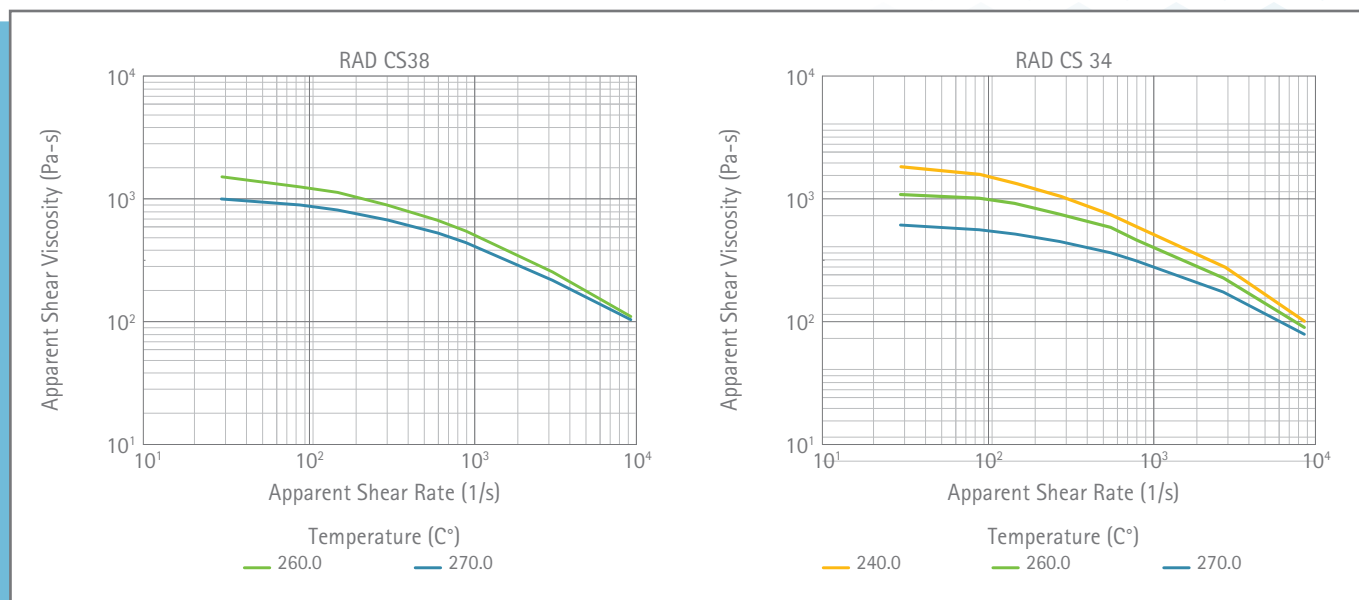
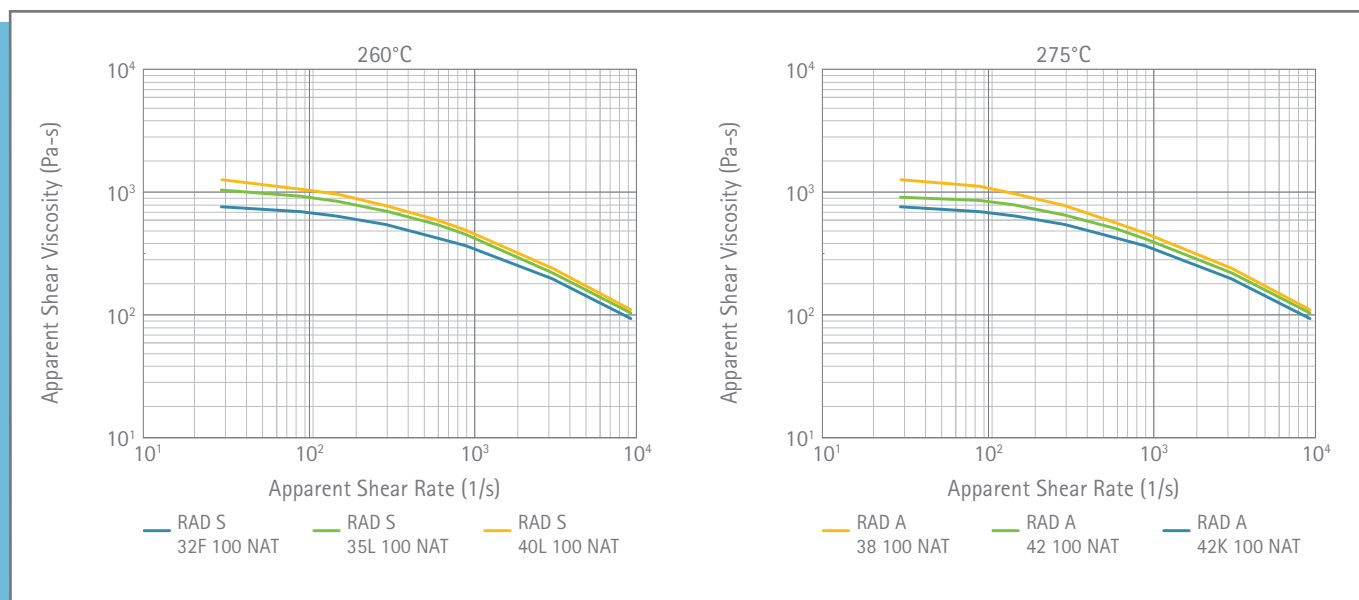


MAIN APPLICATIONS

PRODUCTS		APPLICATIONS
S 32F	PA6 low viscosity	Extrusion and coextrusion coating and monofilaments
S 35L	PA6 medium viscosity	Mono blown and cast coextrusion film - general purpose
S 35FL	PA6 medium viscosity	Cast / blown film and coextrusion BOPA film
S 40L	PA6 high viscosity	Mono blown and cast coextrusion film - general purpose
CA 27	PA6.6 low viscosity	Multilayer blown and cast films
CS 34FL	PA6.66 medium viscosity	Multilayer blown and cast films
CS 38FL	PA6.66 high viscosity	Multilayer blown and cast films
CS 38 TX	PA6.66 high viscosity	Multilayer blown and cast films
A 42	PA6.6 high viscosity	Blown mono / multi layer and monofilament
A 42K	PA6.6 high viscosity	Blown mono / multi layer / shrink casing and bags
A 38	PA6.6 high viscosity	Blown mono / multi layer and monofilament
D 38	PA6.10 high viscosity	Blown mono / multi layer and monofilament
DT 38	PA6.12 high viscosity	Blown mono / multi layer and monofilament

TEMPERATURE SETTINGS

PRODUCTS	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ADAPTER	DIE
S 32F	220-230	220-230	230-240	240-250	250-260	250-260	250-260
S 35L	220-230	240-250	250-260	250-260	250-260	250-260	250-260
S 35FL	220-230	240-250	250-260	250-260	250-260	250-260	250-260
S 40L	230-240	240-250	255-265	255-265	255-265	255-265	255-265
CA 27	255-260	260-265	260-265	260-265	260-265	265-270	265-270
CS 34FL	190-210	220-230	230-240	230-240	240-250	240-250	240-250
CS 38FL	190-210	220-230	230-240	230-240	240-250	240-250	240-250
CS T 38FL	220-230	230-240	240-250	250-260	250-260	250-260	250-260
CS 38 TX	220-230	230-240	240-250	250-260	250-260	250-260	250-260
A 42	260-270	265-270	270-280	275-285	275-285	275-285	275-285
A 42K	260-270	265-270	270-280	275-285	275-285	275-285	275-285
A 38	260-270	265-270	270-280	275-285	275-285	275-285	275-285
D 38	220-230	220-230	230-240	240-250	250-260	250-260	250-260
DT 38	220-230	220-230	230-240	240-250	250-260	250-260	250-260





RADICI NOVACIPS SpA

Via Bedeschi, 20 – 24040 Chignolo d'Isola (BG) – I
Tel. +39 035 4991311 – Fax +39 035 994386
e-mail: italia.plastics@radicigroup.com

RADICI NOVACIPS SpA

Via Provinciale, 1331 – 24020 Villa d'Ogna (BG) – I
Tel. +39 0346 22453 – Fax +39 0346 23730
e-mail: italia.plastics@radicigroup.com

RADICI PLASTICS GmbH

Glockengiesserwall 2 – 20095 Hamburg – D
Tel. +49 40 3095410 – Fax +49 40 30954199
e-mail: deutschland.plastics@radicigroup.com
Production:
Elso-Klöver-Strasse, 10 – Industriegebiet Hafen
21337 Lüneburg – D

RADICI PLASTICS IBERICA SL

Avda. Josep Tarradellas, 130 5^o1^a
08029 Barcelona – ES
Tel. +34 93 5416500 – Fax +34 93 4943326
e-mail: iberica.plastics@radicigroup.com

RADICI PLASTICS UK Ltd.

High Hill House, 6A Hampstead High Street
London NW3 1PR – UK
Tel. +44 20 74314554 – Fax +44 20 74314544
e-mail: uk.plastics@radicigroup.com

RADICI PLASTICS FRANCE SA

65, Rue du Dauphiné – 69800 St. Priest – F
Tel. +33 4 72782090 – Fax +33 4 72782089
e-mail: france.plastics@radicigroup.com



RADICI PLASTICS B.V.

Verloren Van Themaatweg 9 – 6121RG, Born – NL
Tel. +49 40 3095410 – Fax +49 40 30954199
e-mail: deutschland.plastics@radicigroup.com

RADICI PLASTICS LTDA

Rua Giuseppe Marchiori, 497
CEP 18147-970 Araçariçuama – São Paulo – BR
Tel. +55 11 4136 6500 – Fax +55 11 4136 2166
e-mail: brasil.plastics@radicigroup.com

RADICI PLASTICS USA Inc.

960 Seville Road, Wadsworth, OH 44281 – USA
Tel. +1 330 3367611 – Fax +1 330 3362143
e-mail: usa.plastics@radicigroup.com

RADICI PLASTICS (Suzhou) CO., LTD.

No. 49 Ping Sheng Road, SIP
215126 Suzhou, Jiangsu Province – PR China
Tel. +86 512 62952290 – Fax +86 512 62952291
e-mail: china.plastics@radicigroup.com

RADICI PLASTICS INDIA PRIVATE LIMITED

DSM-501, 5th Floor, DLF Tower,
Shivaji Marg, New Delhi – 110015 – IN
Tel. +91 11 41638170
e-mail: info.plastics@radicigroup.com

RADICI PLASTICS MEXICO S. DE R.L. DE C.V.

Av. Francisco Zarco 2688
C.P. 47810 – Col. Loma Bonita – Ocotlán Jalisco – MX
Tel. +52 392 923 2390
e-mail: info.plastics@radicigroup.com

The information provided in this document is supplied in good faith and corresponds to Radici Plastics' knowledge at the date of its publication. This information may be subject to revision as new knowledge becomes available. The numerical data presented in this document are values obtained by measurement under prescribed conditions. The release of this data by Radici Plastics does not constitute a guarantee of the quality and/or safety of your company's finished products. Radici Plastics makes no warranties and assumes no liability in connection with any use of this information.