

TECHNICAL BULLETIN

NOFIA PHOSPHONATES FOR PC APPLICATIONS

Overview

Nofia poly(phosphonate-co-carbonates) have inherent flame retardant (FR) properties and make it now possible to produce thin FR (UL94 VTM0 down to 0.2 mm) polycarbonate (PC) compounds for film, sheet, and injection molding applications.

Sample testing protocols include: UL94 V0 and VTM0, NF P92-507 ("M1 test"), DIN 4102-1, ASTM E162 and E84, US and Canadian Rail standards, EN45545, FAR 25:853, and FMVSS 302.

Features and Benefits

- V0/0.4mm, VTM0/0.2mm
- Transparent
- Low heat release

Applications include:

- Transparent, thin moldings
- Extruded sheet (0.8 – 3 mm)
- Profiles
- PC film for electronic and electrical applications and building and construction materials

FRX Polymers' Product Offerings

Nofia poly(phosphonate-co-carbonates) are copolymers that contain 4 – 7 wt% of phosphorus and are used at various levels of addition to pass a variety of applications where FR performance is needed. They can be used as a blend or as a standalone material for injection molding and film and sheet applications.

	Nofia CO3000	Nofia CO4000	Nofia CO6000
MVR [ml/10 min]	12 (260°C/2.16kg)	12 (260°C/2.16kg)	14 (260°C/2.16kg)
Phosphorus [wt%]	4	5	6.5
Tg [°C]	132°C	127°C	121°C
Appearance	Clear pellets	Clear pellets	Clear pellets

Make Your Own Custom Copolymers

By using pure Nofia phosphonates and a chain extender, like e.g. Joncryn[®] compounds, one can produce their own custom copolymer via reactive extrusion. Nofia HM1100 and HM9000, which contain > 10wt% of phosphorus, are particularly suited for this approach. Thus, production of a wide range of phosphorus content copolymers are possible.

	Nofia HM1100	Nofia HM9000
MVR [ml/10 min]	10 (240°C/1.2kg)	10 (200°C/1.2kg)
Phosphorus [wt%]	10.6	10.6
Tg [°C]	105°C	105°C
Appearance	Clear pellets	Clear pellets

- ▶ The loading level of Nofia HM1100 can be varied to make compounds with different levels of phosphorus.
- ▶ Difference properties of PC/Nofia phosphonates/Joncryn blends are obtained with different Joncryn grades
- ▶ Joncryn loading should be adjusted to form a single Tg for the blend, as well as reach the targeted flow. The required loading level of Joncryn will also depend on the moisture level in the starting materials.
- ▶ The molecular weight (flow) of PC should be chosen based on property targets. Higher molecular weight PC gives better/more robust notched Izod impact properties.
- ▶ Recommended compounding temperature from feed zone to die: 200/260/285/285/285/285/285/285°C.

	EX3022	EX4022	EX6022
PC (MVR 6 ml/10min, 300°C, 1.2kg) [wt%]	64	54	39
Nofia HM1100 [wt%]	35	45	60
Joncryl 4400 [wt%]	1	1	1
P [wt%]	3.7	4.8	6.4
MVR (260°C/2.16kg) [ml/10 min]	15	20	25
Tg [°C]	126°C	122°C	118°C
Unnotched Impact (1.6mm) [J/m]	1,300 (NB)	1,300 (NB)	1,300 (NB)
Notched Impact (1.6mm) [J/m]	1,000 (NB)	1,000 (NB)	100
UL94 rating	V0/0.8mm	V0/0.4mm	V0/0.4mm
FAR 25.853 (0.8mm)	Class B	Class A	Class A
Appearance	Clear pellets	Clear pellets	Clear pellets

Joncryl® is a registered trademark of BASF Corporation.

Drying Guidelines for Nofia Phosphonates

Nofia phosphonates are hygroscopic materials and quickly absorb moisture from the atmosphere. The presence of moisture will hydrolyze the polymer in the melt phase, reducing the molecular weight. Therefore, it is critical that the material is thoroughly dried prior to melt processing (<50 – 200 ppm moisture). For recommendations on drying, please refer to FRX Polymers' Technical Bulletin "Nofia Phosphonates Drying Recommendations".

The Tg of Joncryl 4400 is 65°C, which is lower than the polymers. Thus, need to cool down the polymers before dry blending with Joncryl. Consult BASF for handling and feeding of Joncryl.

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FRX Polymers, Inc.

200 Turnpike Road
Chelmsford, MA 01824

Tel: +1 (978) 250-4200 • Fax: +1 (978) 250-4533

Email: info@frxpolymers.com

www.frxpolymers.com

