

PARALOID™ BTA-753 ER MBS Impact Modifier Maximum Impact Strength Efficiency at Low Temperatures for Vinyl Opaque and Translucent Applications

Description

PARALOID BTA-753 ER impact modifier is recommended for use in a wide variety of non-weatherable vinyl applications, which include:

Rigid

- Extruded or calendered film and sheet
- Blow moulded opaque bottles where superior low-temperature bottle drop performance is required
- Extruded conduit, pipe and profile
- Injection moulded parts, such as fittings and appliance housings

Semi-rigid and flexible

- Calendered sheet and film
- Extruded profile

PARALOID BTA 753 ER offers the processors of vinyl compounds the following features and advantages:

- Superior impact resistance at low temperatures
- Excellent processability and colour stability in all types of vinyl compounds
- Excellent dispersibility
- Can maintain good transparency in copolymer formulations
- Free flowing powder characteristics
- Compliance with the FDA N° 21 CFR 178 3790, and most European food packaging regulations*

The BTA 753 ER production process has obtained the ISO 9002 quality assurance certification.

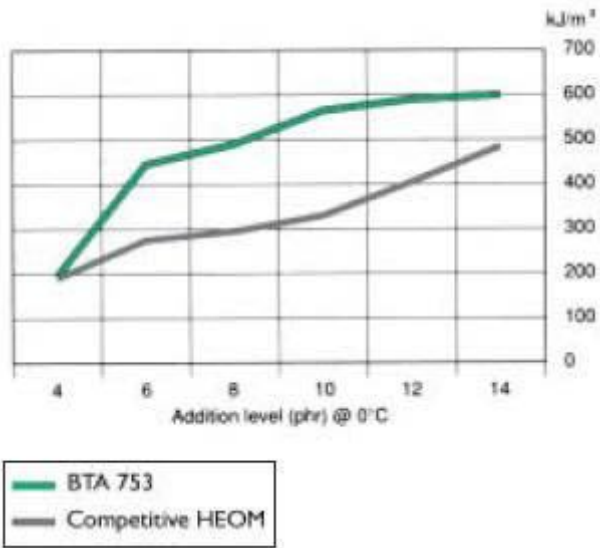
*For further information on food contact compliance of our products, please refer to the local Rohm and Haas Sales Subsidiary.

Film, Sheet and Bottles

Impact Efficiency

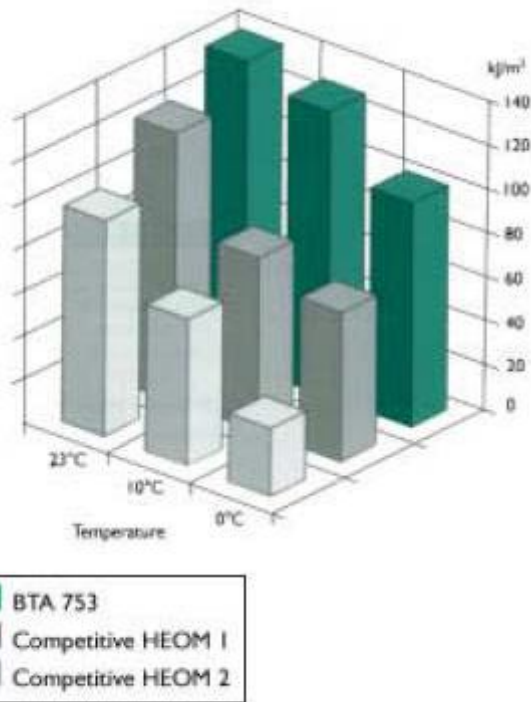
PARALOID BTA 753 ER, high efficiency opaque modifier (HEOM), provides exceptionally high impact strength retention at low temperatures. In the following tests, PARALOID BTA 753 ER demonstrates it improved impact efficiency in comparison with competitive HEOMs.

Tensile Impact Test



S PVC K60, Sn stabilised formulation
 Sample preparation: Collin two-roll milled sheet,
 200 µ gauge film

Notched Izod Impact Test



Ductility (%)

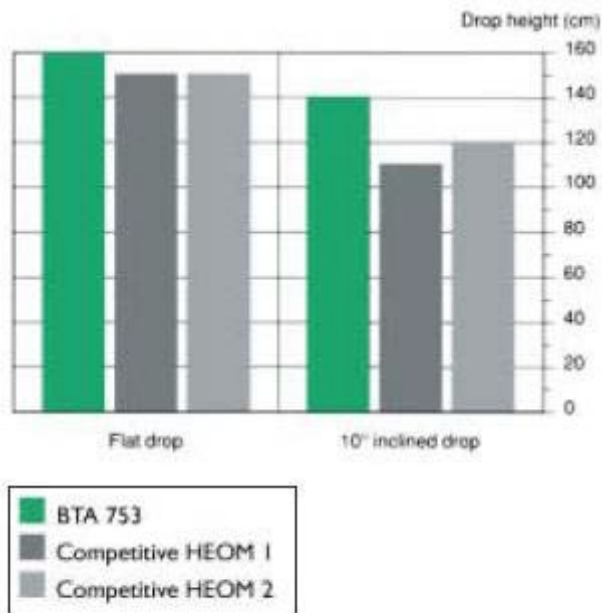
	23°C	10°C	0°C
PARALOID BTA 753 ER	100	100	100
Competitive HEOM 1	100	80	70
Competitive HEOM 2	100	70	50

Formulation

S PVC K60	100.0
PARALOID BTA 753 ER	10.0
PARALOID K120N	1.2
PARALOID K175 ER	0.8
Sn mercaptide stabiliser	1.5
Triglycerol ester of hydroxy saturated fatty acid	0.7
Ester of montanic acid	0.2
Polyethylene wax	0.1
Blue toner	0.005
Violet toner	0.011

Bottle Drop Impact Test

PARALOID BTA 753 ER modified bottles dropped onto either a flat or inclined surface show superior performance compared to bottles based on competitive HEOM products.



S PVC K57, Sn bottle formulation with 6 phr impact modifier
Test conditions:
1 -litre PVC round-ribbed 36-g bottle:
Bruceton staircase drop height method, 50% mean failure height.
Extrusion blow moulding conditions: Bekum BA 3-S50, L/D ratio 24:1,
• nozzle/mandrel diameters (mm) = 25 / 22.6
• temperatures (°C):
- cylinder: 150, 165, 170
- die head: 175, 178

Processability

The following tests were performed in an Sn stabilised, S PVC K60 formulation.

Brabender Performance

As with all MBS impact modifiers in the BTA 700 range, PARALOID BTA 753 ER displays fast fusion characteristics.

	BTA 753	Competitive HEOM 1	Competitive HEOM 2
Fusion time (s)	65	70	85
Fusion torque (Nm)	37.5	37.0	38.0
Fusion temperature (°C)	157	158	158
Equilibrium torque (Nm)	24.0	24.0	25.0
Equilibrium temperature (°C)	167	168	168

Test conditions:
W30 rotor, 150°C, 30 RPM, 32 g

Thermal Stability

Although fusion is rapid, PARALOID BTA 753 ER maintains excellent thermal stability.

	Time to colour (minutes)		
	Initial colour change	Yellow	Char
PARALOID BTA 753 ER	27	45–48	> 54
Competitive HEOM 1	24	39	45
Competitive HEOM 2	24	42	48

Dynamic mill stability measured at 180°C

Dispersion

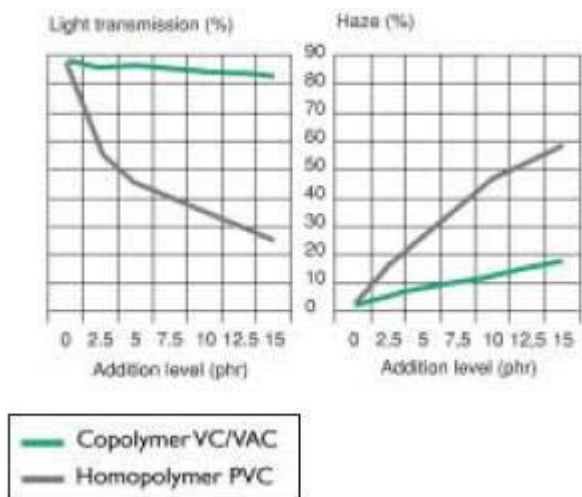
	Unmodified	BTA 753	Competitive HEOM 1	Competitive HEOM 2
Dispersion rating	30	30	35–40	40

Dispersion rating 0 -100 where
0 = Gel free / excellent dispersion
100 Sandpaper / high gel content

Optical Properties

Though PARALOID BTA 753 ER is generally used in opaque or translucent PVC articles, the modifier does display good clarity and dispersibility in thin PVC films. Good clarity can be maintained in PVC formulations based on acetate copolymer. This makes PARALOID BTA 753 ER an excellent choice for high speed thermoforming of copolymer sheets used for pharmaceutical and deep freeze containers.

Light Transmission and Haze Tests



Test conditions:
3 mm mill-moulded plate

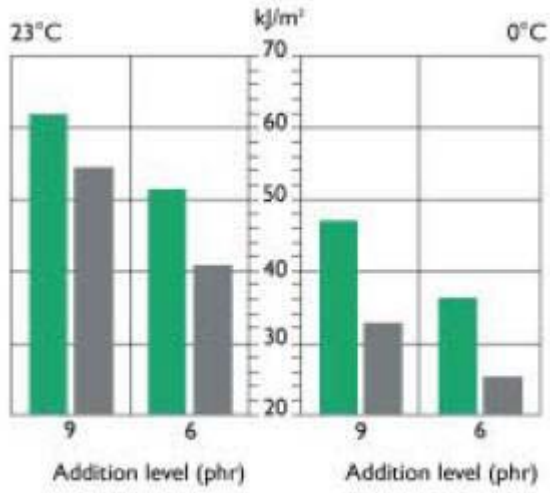
	Homo-polymer formulation	Co-polymer formulation
S PVC K57	100.0	-
VC/VAC (90/10) K57	-	100.0
PARALOID BTA 753 ER	as indicated	
PARALOID K120N	1.0	1.0
Glycerol mono oleate	1.2	1.2
Sn mercaptide stabiliser	1.5	1.5
Ester of montanic acid with ethylene glycol	0.3	0.3

Pipe, Profile and Injection Moulding

Impact Efficiency

These tests show the excellent impact efficiency given by PARALOID BTA 753 ER, in both extruded and mill moulded plates over a wide temperature range. The high impact performance obtained, even with low addition levels, can be used to achieve a consistent level of toughness in production and use. The outstanding performance at high addition levels allows optimum strength to be retained at low temperatures.

Double V-Notch Charpy Test (S PVC K65)

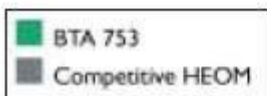
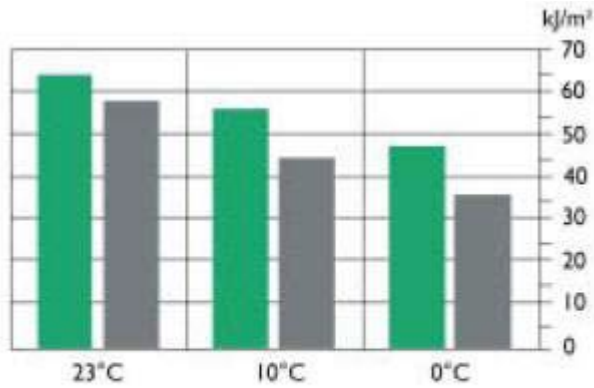


Test conditions:
 3-mm mill-moulded plates

Pb-stabilised formulation

S PVC K65	100.0
PARALOID K120N	1.0
Precipitated calcium carbonate	2.0
Pb stabilised one-pack	4.2
PARALOID BTA 753 ER	as indicated

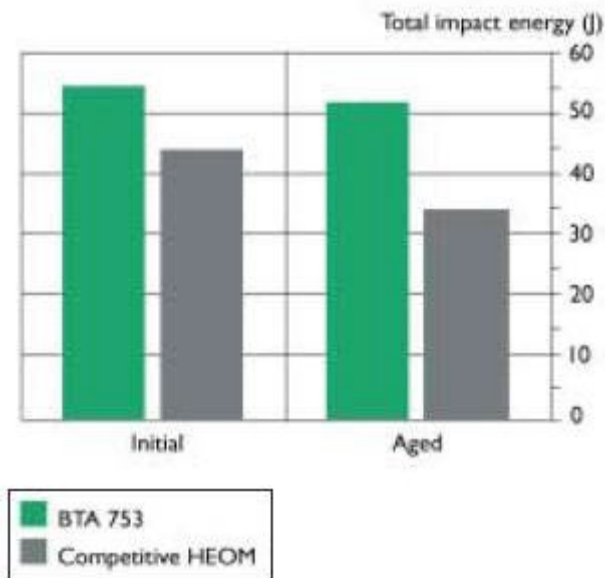
Double V-Notch Charpy Test (S PVC K68/C-PVC)



Pb-stabilised formulation

S PVC K68	60.0
C-PVC	40.0
Tri basic Pb sulphate	4.2
Neutral Pb stearate	0.5
Ca stearate	0.5
Ester of montanic acid with ethylene glycerol	1.0
Paraffin wax	1.4
Calcium carbonate	10
Carbon black	1
PARALOID BTA 753 ER	7

Dynatup Instrumented Failing Weight Impact Test



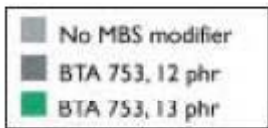
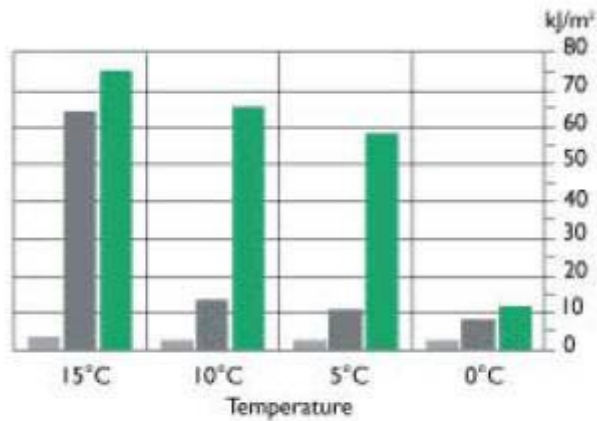
Test conditions:
Samples were aged for 10 days in an oven at 60°C

Conduit formulation

S PVC K66	100.0
PARALOID BTA 753 ER	9.5
Pb stabilised one-pack	4.2
Precipitated calcium carbonate	2
PARALOID K120N	2

Notched Izod Impact Test

Even with low K-value PVC resins and at low temperatures, it is possible to achieve ductility with PARALOID BTA 753 ER.



Ductility (%)

	15°C	10°C	5°C	0°C
No MBS modifier	0	0	0	0
BTA 753, 12 phr	100	0	0	0
BTA 753, 13 phr	100	100	100	0

Sn-stabilised formulation (injection moulding)

S PVC K50	100.0
Methyl Sn stabiliser	2.0
Cetyl Stearyl alcohol	2.0
Polyethylene wax	0.2
PARALOID K125 ER	1.0
PARALOID K175 ER	1.0
TiO ₂	2.5
PARALOID BTA 753 ER	as indicated

Processability

Brabender Performance (PVC/C-PVC PIPE)

PARALOID BTA 753 ER displays the fastest fusion characteristics of the BTA 700 range.

	PARALOID BTA 753 ER, 7 phr	Competitive HEOM, 7 phr
Fusion time (s)	106	182
Fusion torque (Nm)	48.3	40.8
Fusion temperature (°C)	186	189

Equilibrium torque (Nm)	33.4	32.2
Equilibrium temperature (°C)	211	204

Test conditions: 180°C, 50 RPM, 58 g

Dynamic Heat Stability (PVC/C-PVC Pipe)

The fast fusion characteristics of PARALOID BTA 753 ER have no effect on the dynamic heat stability of a C-PVC formulation.

	PARALOID BTA 753	Competitive HEOM
Time to brown (minutes)	50	50

Percent Mould Fill (Injection-Moulding)

	PARALOID BTA 753, 10 phr	Competitive HEOM, 10 phr
Injection pressure (%)		
10	52.3	48.4
15	61.7	57.7
20	78.5	70.4
25	92.1	86.9
30	99.5	99.5
35	100.0	100.0
Melt temperature (°C)	206	210

Test conditions:
Two roll mill, 200°C, 15/25 RPM. 0.5 mm gap

Formulations

Specific formulations must be fine-tuned to meet the requirements of the particular compounds and the production equipment used. The following formulations are recommended as starting points.

Film and Sheet

Sn-Stabilised S PVC K60

S PVC resin K60	100.0
PARALOID BTA 753 ER	5.0
PARALOID K175 ER	2.0
Sn mercaptide stabiliser	1.0
Glycerol mono - oleate	0.8
Ethylene di stearamide	0.2
Ester of montanic acid with ethylene glycol	0.3
Blue toner	0.006
Violet toner	0.014

Bottles

Sn-Stabilised S PVC K57

S PVC resin K57	100.0
PARALOID BTA 753 ER	8.0

PARALOID K120N ER	1.0
PARALOID K175 ER	0.8
Sn mercaptide stabiliser	1.5
Glycerol Mono oleate	0.8
Partially esterified wax of montanic acid	0.25
Polar polyethylene wax	0.15
Blue toner	0.006
Violet toner	0.014

Profile

S PVC K65	100.0
PARALOID BTA 753 ER	4
PARALOID K120N	1.0
Tri-basic Pb sulphate	2.0
Di-basic Pb Stearate	0.4
Neutral Pb Stearate	0.5
Calcium Stearate	0.25
Palmityl Stearyl Phthalate	0.6
Neutral ester wax	0.3
CaCO ₃	5
Pigment	as necessary

Injection Moulded Products

Pb Stabilised

S PVC K 57-62	100.0
PARALOID BTA 753 ER	3-5
PARALOID K120N ER	2.0
PARALOID K175 ER	1.0
Tri-basic Pb Sulphate	3.5
Di-basic Pb Stearate	0.5
Di carboxylic acid ester of saturated alcohol	1.2
Calcium Stearate	0.23
Paraffin Wax	0.15

High-Flow Methyl-Sn Stabilised

S PVC K50	100.0
PARALOID BTA 753 ER	10
PARALOID K125 ER	1.5
PARALOID K175 ER	1.5
Methyl Sn Stabiliser	2.0
Glycerol Mono Stearate	0.6
Di carboxylic acid ester of saturated alcohol	0.5
Polar Polyethylene Wax	0.15
TiO ₂ Pigment	2

Test Standards

Rohm and Haas products are tested according to the following international standards.

Test	Standard
Double V-Notch Charpy	DIN 53753
U-Notch Charpy	DIN 53453
Tensile Impact	DIN 53448
Notched Izod	ISO-R-180

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