Monsanto
PLASTICIZERS

Technical Bulletin O/PL-328

MONTAR® POLYCHLORINATED POLYPHENYL COMPOUNDS

Introduction

Monsanto's Montar® polychlorinated polyphenyl compounds resist oxidation, impart flame retardance and tackiness to asphaltic, rubber, and various synthetic-resin compositions.

These compounds are effective low-cost solid plasticizer binders or tackifiers for adhesives, mastics, or hot-melt systems in which color is not objectionable. They are readily incorporated in rubber-based paper adhesives when dissolved in a suitable solvent.

The chlorinated polyphenyls contribute flame retardance to specialty asphalt products; Montar 4 in concentrations of 30 per cent or more yields products with instantaneous flame-out.

All Montar products are compatible with polyvinyl chloride at concentrations of up to about 10 parts per 100 parts of resin and can be used as extender plasticizers to reduce formulating costs. They have been reported to be useful as extenders in epoxy resins, and their structure suggests that they may be useful as plasticizers for several other synthetic resins.

Montar compounds are high-melting, dark, chlorinated polyphenyls (Montar, 1, 2, 3, 4, 5) or a mixture of unchlorinated polyphenyls (Montar 9).

Applications

Asphalt

All the Montar products are compatible with asphalt at concentrations up to two parts per part of asphalt. Montar 4 contributes flame retardance at concentrations as low as 10 percent, with instantaneous flame-out above 30 percent. This property is caused by the formation of an intumescent layer, which "snuffs" the flame. The test method and test results are as follows:

Montar 4 was added to molten asphalt, and the mixture was heated to 190°C to dissolve the Montar 4. The solution was heated in a cru-

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cible until flames occurred (approximately 200°C). The time required for the flames to go out after removal of the heat was measured.

Montar® 4 Content (%)	*Flame-out Time* (*seconds*)
0	210
10	90
20	10-20
30	Instantaneous
50	Instantaneous
67	Instantaneous

Both softening point and brittleness of the asphalt blend are increased as the concentration of Montar 4 is increased.

Rubber-Based Adhesives

A 50 percent solution of Montar 2, 4, or 5 in an aromatic solvent mixed with a 60 percent solids rubber emulsion (1:1 ratio) yields paper adhesives with good tack.

The emulsifiability of all the Montar products suggests additional applications in the adhesives field. When 5 percent of an emulsifier was added to a 50 percent solution of Montar in benzene or toluene and the mixture was progressively diluted with water, the emulsion did not break until water dilution reached 160 percent of the original mixture volume.

Neoprene

From 10 to 40 parts of Montar 4 or 5 per 100 parts of Neoprene W mine-cable stock cannot only replace antimony oxide with maintenance of zero flame-out time and reduction of after glow and smoking time, but also improves the tensile strength after aging and slightly softens the stock.

Vinyls

Up to 10 parts of any Montar product can be blended with 100 parts of polyvinyl chloride resin by simple mixing.

Cellulosics

The Montar products are suggested as potentially useful low-cost extenders for ethyl cellulose. They would also impart flame retardancy where desirable.

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Typical Physical Properties

Property	*Polychlorinated Polyphenyls*					*Polyphenyl*
	Montar® 1	*Montar 2*	*Montar 3*	*Montar 4*	*Montar 5*	*Montar 9*
Appearance (Monsanto specification)	Black solid	Black solid	Black solid	Black solid	Dark brown or black solid	Black solid
Softening Range, °C	54-160	70-170	86-168	92-206	155-195	130-175
Acidity, mg. KOH/g	Slightly basic	Slightly basic	Slightly basic	Slightly basic	Slightly basic	0.1-0.3
Chlorine, %	36-42	44-48	50-52	54-56	53-55	none
Calcium Oxide, %	5-15	5-15	5-10	5-10	1-3	none
Iron, %	0.5-1.0	0.5-1.0	0.3-0.6	0.5-1.0	0.1-0.2	0.2-0.4
Flash Point (C.O.C.), °F	500-620	—	—	—	—	450-550
Fire Point (C.O.C.), °F	—	—	—	—	—	530-630

Solubility

Montar®	*Benzene*	*Toluene*	*Kerosene*	*Methanol*	*Acetone*
1	VS	VS	S	SS	VSS
2	VS	VS	S	SS	VSS
3	VS	VS	S	SS	VSS
4	VS	VS	S	SS	VSS
5	VS	VS	VS	SS	SS
9	VS	VS	SS	I	SS

Key: I — Insoluble
VSS — Very slightly soluble
SS — Slightly soluble
S — Soluble
VS — Very soluble

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Toxicity and Safe Handling

Since Montar 1 to 5 resins are chlorinated hydrocarbons, prolonged or repeated breathing of the vapors should be avoided, especially at elevated temperatures. Either local exhaust and adequate ventilation or suitable respiratory protection are suggested.

Contact with eyes and prolonged or repeated skin contact should be avoided. If skin contact occurs, remove the material by washing with soap and water. Clothing that becomes soaked with fluids that contain a Montar compound should be laundered — before being worn again. No special handling precautions, other than good industrial practice, is needed for Montar 9, which is not a chlorinated hydrocarbon.

Shipping

Shipping Classification		Coal tar resin	
Labeling Requirements		Product label required by law	
Regulations		None	
Standard Containers	Montar	Galvanized Drum	Fiber Drum
		(net weight, pounds)	
	1, 2, 3, 4	500	500
	5 (crushed)	—	375
	9	375	—

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