UNSATURATED POLYSTER RESINS

Solutions that fit

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SP Automotive GmbH

Unsaturated Polyester Resins

About HEM-PRO

The Hempro-Color d.o.o. Sid is a reputable producer of polyester resins, paints, lacquers, school tempera, oil art paints, synthetic binders, plastic packaging, and other chemical goods. The company's production range is intended for all sorts of protection and decoration of a variety of substrates including metal, wood, plaster, and concrete Hempro-Color operates in the consumer goods sector as well as specialty markets e.g. industrial sector, automotive, and transportation or construction.

Business premises, infrastructure, and three modern production facilities occupy an area of over 8,000 m2. The manufacturing site is close to freeway E70 and the railway line Belgrade-Zagreb, both being a major way to connect business and production centers in Western Balkans and Mediterranean seaports.

The rated capacities of the factory are:
1. COATING PLANT - paints and lacquers: 10,000 tons annually
2. SYNTHESIS PLANT - production of resins: 3,000 tons annually
3. PLASTICS PLANT - production of plastic packaging: 150,000 units annually

Our polyester site in Sid comprises fully integrated processes from raw materials inspection to quality control of end products. We produce more than 50 different references of unsaturated polyester resins. Our highly qualified and experienced personnel is able to develop customized products that meet specific requirements. Standard UPRs are available out of stock in Western Balkans as well as in Germany.

About SP AUTOMOTIVE

The SP AUTOMOTIVE GmbH, Koblenz is a reputable producer and distributor of a variety of chemicals incl. polyester resins, deicing agents, and resin intermediates. The company operates granulation lines in China and stores materials in multiple warehouses in Europe. Cooperation with the manufacturing house company Hempro-Color comprises marketing, technical service, and sales support in the EMEA region and embraces the whole portfolio of UPRs available out of the Serbian site.
We provide expert knowledge to stakeholders from the automotive, construction, and aviation industries.

Unsaturated Polyester Resins (UPR)

Unsaturated polyesters are a class of thermoset molding resins. UPRs are produced in the condensation reaction between diols, saturated and unsaturated anhydrides or acids cured with the help of vinylic monomers e.g styrene.
They are typically sold in liquid form in an unsaturated and reactive solvent, normally styrene. Grades with different viscosities, unsaturation, and cure speed are available. Major grades of UPRs available from HEMPRO site are presented in the tables below broken down into the most relevant application techniques.

Hand Lay-up and Spray-up

Reference	RADOPOL A300MC (*)	RADOPOL IN600 NC (*)	RADOPOL T200 PMCTE	RADOPOL T200 MC (*)	RADOPOL T201 PMBE	RADOPOL T202 PMBE	RADOPOL T203 PLBS
Characteristics	mid reactive / mid viscosous / not accelareted / water resistant / low shrinkage coeficient	reactive / mid viscosous / not accelareted / chemically resistant / water resistant / resistant to air and UV	mid reactive / mid viscosous / accelareted / tixotropic / chemically resistant / water resistant / lowered styrene emmision	mid reactive / mid viscosous / non-accelareted / tixotropic / chemically resistant / water resistant /	mid reactive / mid viscosous / accelareted / tixotropic / water resistant / lowered styrene emmision	mid reactive / mid viscosous / accelareted / tixotropic / water resistant / lowered styrene emmision	mid reactive / low viscosous / accelareted / chemically resistant / water resistant
Marketing Claim	low shrinkage	chemically resistant / UV resistant	chemically resistant / low styrene	chemically resistant	low styrene	low styrene	chemically resistant
Resin base / chemical structure	orthophtalic acid / standard glycols / styrene	isophthalic acid / NPG / styrene + MMA	terepthatalic acid / standard glycols / styrene	terephthalic acid / standard glycols / styrene	terephthalic acid / standard glycols / styrene	terephthalic acid / standard glycols / styrene	terephthalic acid / standard glycols / styrene
Non-volatile matter [%]	60	64	60	64	61	61	55
Viscosity [mPa.s] Brookfield LV sp62/12rpm, (23C)	300	450	500	300	300	300	97.5
Elongation at break [%]	2.6	4.0	3.7	3.7	3.7	3.7	3.7
Tensile strength [MPa]	67	72	70	70	70	70	70
HDT [°C]	68	90	77	75	75	75	70
LSE	n	n	y	n	y	y	n
Thixotropic	n	n	y	y	y	y	n
Gel time at 20 °C [min] / 2% Co (1%) - 2% MEKP	9.5	11.5	20	9.5	9.5	20	12

(*) accelarated version available

Filament Winding

Reference	RADOPOL T400 MC	RADOPOL T400LC	RADOPOL T400PMC	RADOPOL T401 PMC
characteristics	mid reactive / mid viscosous / accelareted / chemically resistant / water resistant	mid reactive / low viscosous / not accelareted / chemically resistant / water resistant	mid reactive / mid viscosous / not accelareted / chemically resistant / water resistant	mid reactive / mid viscosous / accelareted / chemically resistant / water resistant
Marketing Claim	chemically resistant	chemically resistant	chemically resistant	chemically resistant
Resin base / chemical structure	terephthalic acid + orthophthalic acid / standard glycols / styrene	terephthalic acid / standard glycols / styrene	terephthalic acid / standard glycols / styrene	terephthalic acid / standard glycols / styrene
Non-volatile matter [%]	62	62	62	62
Viscosity [mPa.s] (Brookfield LV sp62/12rpm, (23C))	300	225	300	300
Elongation at break [%]	3.7	3.7	3.7	3.7
Tensile strength [MPa]	75	75	75	75
HDT [°C]	85	85	85	85
LSE	n	n	n	n
Thixotropic	n	n	n	n
Gel time at 20 °C [min] / 2% Co (1%) - 2% MEKP	34	20	34	37.5

Mid-Size and Large Objects / Special Applications

Reference	RADOPOL T402 PNCTE	RADOPOL T403 PLCTE
characteristics	mid reactive / mid viscosous / accelareted / tixotropic / water resistant / lowered styrene emmision	mid reactive / low viscosous / accelareted / tixotropic / water resistant / lowered styrene emmision
Marketing Claim	low styrene	low styrene
Resin base / chemical structure	terephthalic acid / standard glycols / styrene	terephthalic acid / standard glycols / styrene
Non-volatile matter [%]	62	62
Viscosity [mPa.s] Brookfield LV sp62/12rpm, (23C)	500	500
Elongation at break [%]	3.7	3.7
Tensile strength [MPa]	75	75
HDT [°C]	85	85
LSE	y	y
Thixotropic	y	y
Gel time at 20 °C [min] / 2% Co (1%) - 2% MEKP	20	20

Product Focus List / Best Availability and Cost Position

Reference	Characteristics	Marketing Claim	Resin base / chemical structure	Non-volatile matter [%]	Viscosity [mPa.s] Brookfield LV sp62/12rpm, (23C)	Elongation at break [%]	Tensile strength [MPa]	HDT [°C]	LSE	Thixotropic	Gel time at 20 °C [min] / 2% Co (1%) - 2% MEKP
RADOPOL A300MC	mid reactive / mid viscosous / not accelareted / water resistant / low shrinkage coeficient	low shrinkage	orthophtalic acid / standard glycols / styrene	60	300	2.6	67	68	n	n	9.5
RADOPOL A300PMC	mid reactive / mid viscosous / accelareted / water resistant / lowered shrinkage coeficient	low shrinkage	orthophtalic acid / standard glycols / styrene	60	300	2.6	67	68	n	n	9.5
RADOPOL IN600 NC	reactive / mid viscosous / not accelareted / chemically resistant / water resistant / resistant to air and UV	chemically resistant / UV resistant	isophthalic acid / NPG / styrene + MMA	64	450	4.0	72	90	n	n	11.5
RADOPOL IN600 PNC	reactive / mid viscosous / accelareted / tixotropic / chemically resistant / water resistant / resistant to air and UV	chemically resistant / UV resistant / reactive	isophthalic acid / NPG / styrene + MMA	64	450	4.0	72	90	n	n	11.5
RADOPOL T200 PMCTE	mid reactive / mid viscosous / accelareted / tixotropic / chemically resistant / water resistant / lowered styrene emmision	chemically resistant / low styrene	terepthatalic acid / standard glycols / styrene	60	500	3.7	70	77	y	y	20
RADOPOL T200 MC	mid reactive / mid viscosous / non-accelareted / tixotropic / chemically resistant / water resistant /	chemically resistant	terephthalic acid / standard glycols / styrene	64	300	3.7	70	75	n	y	9.5
RADOPOL T200PMC	mid reactive / mid viscosous / accelareted / tixotropic / chemically resistant / water resistant /	chemically resistant	terephthalic acid / standard glycols / styrene	64	300	3.7	70	75	n	y	9.5
RADOPOL T201 PMBE	mid reactive / mid viscosous / accelareted / tixotropic / water resistant / lowered styrene emmision	low styrene	terephthalic acid / standard glycols / styrene	61	300	3.7	70	75	y	y	9.5
RADOPOL T202 PMBE	mid reactive / mid viscosous / accelareted / tixotropic / water resistant / lowered styrene emmision	low styrene	terephthalic acid / standard glycols / styrene	61	300	3.7	70	75	y	y	20
RADOPOL T203 PLBS	mid reactive / low viscosous / accelareted / chemically resistant / water resistant	chemically resistant	terephthalic acid / standard glycols / styrene	55	97.5	3.7	70	70	n	n	12

Curing system / 100 g of resin: 1 см3 Butanox M50 + 0.2 см3 Co(1%), 24 h @25 °C, post-curing 24h @ 100 °C

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