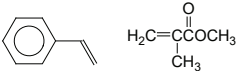


# SMAA poly(styrene-co-methylmethacrylate)

PARAMETER	UNIT	VALUE	REFERENCES
<b>GENERAL</b>			
Common name	-	poly(styrene-co-methylmethacrylate)	
ACS name	-	2-propenoic acid, 2-methyl-, methyl ester, polymer with ethenylbenzene	
Acronym	-	SMMA	
CAS number	-	25034-86-0	
<b>SYNTHESIS</b>			
Monomer(s) structure	-		
Monomer(s) CAS number(s)	-	100-42-5; 80-62-6	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	104.15; 100.12	
Styrene content	mol%	40-59	Jiang, Z Y; Jiang, X Q; Huang, Y J; Lin, J; Li, S M; Li, S Z; Hsia, Y F, Nuclear Instruments Methods Phys. Res., B245, 491-94, 2006.
Method of synthesis	-	radical polymerization of styrene and methyl methacrylate	
Yield	%	98	Corona-Rivera, M A; Flores, J; Puig, J E; Mendizabal, E, Polym. Eng. Sci., 49, 2125-31, 2009.
Number average molecular weight, $M_n$	dalton, g/mol, amu	6,000-150,000	
Mass average molecular weight, $M_w$	dalton, g/mol, amu	217,000-315,000	Zhu, S; Paul, D R, Polymer, 44, 3009-19, 2003.
Polydispersity, $M_w/M_n$	-	1.9-2.3	
Molecular cross-sectional area, calculated	cm <sup>2</sup> x 10 <sup>-16</sup>	38.0	
<b>STRUCTURE</b>			
Entanglement molecular weight	dalton, g/mol, amu	calc.=7,624	
<b>COMMERCIAL POLYMERS</b>			
Some manufacturers	-	Ineos, Shin-A	
Trade names	-	Nas, Zylar; Claradex	
<b>PHYSICAL PROPERTIES</b>			
Density at 20°C	g cm <sup>-3</sup>	1.04-1.13	
Color	-	colorless to white	
Refractive index, 20°C	-	1.53-1.57	
Transmittance	%	88-91.3	
Haze	%	0.3-2	
Odor	-	odorless	
Softening point	°C	103	
Decomposition temperature	°C	260-280	
Glass transition temperature	°C	86-118	
Heat deflection temperature at 1.8 MPa	°C	67-94	

# SMAA poly(styrene-co-methylmethacrylate)

PARAMETER	UNIT	VALUE	REFERENCES
Vicat temperature VST/B/50	°C	88-106	
<b>MECHANICAL &amp; RHEOLOGICAL PROPERTIES</b>			
Tensile strength	MPa	19-52	
Tensile modulus	MPa	2,100-3,200	
Tensile stress at yield	MPa	29-62	
Elongation	%	2-140	
Tensile yield strain	%	4	
Flexural strength	MPa	46-100	
Flexural modulus	MPa	1,900-3,200	
Charpy impact strength, notched, 23°C	kJ m <sup>-2</sup>	0.8	
Izod impact strength, unnotched, 23°C	J m <sup>-1</sup>	160-260	
Izod impact strength, notched, 23°C	J m <sup>-1</sup>	20-160	
Poisson's ratio	-	calc.=0.361	
Rockwell hardness	-	L95; M70-76	
Shrinkage	%	0.2-0.6	
Melt index, 230°C/5 kg	g/10 min	0.2-4.3 (190°C/5 kg); 0.13-5 (230°C/5 kg)	
Water absorption, equilibrium in water at 23°C	%	0.15-0.17	
<b>CHEMICAL RESISTANCE</b>			
Alcohols	-	good	
Aliphatic hydrocarbons	-	good	
Aromatic hydrocarbons	-	poor	
Halogenated hydrocarbons	-	poor	
Ketones	-	poor	
⊖ solvent, ⊖-temp.=40-59, 61-68°C	-	2-ethoxy ethanol, cyclohexanol	
Good solvent	-	DMF, THF, toluene	
<b>FLAMMABILITY</b>			
Flammability according to UL-standard; thickness 1.6/0.8 mm	class	HB	
Ignition temperature	°C	>250	
Autoignition temperature	°C	430	
Volatile products of combustion	-	CO, CO <sub>2</sub>	
<b>WEATHER STABILITY</b>			
Products of degradation	-	hydroperoxides, hydroxyl, radicals, chain scission	Torikai, A; Hozumi, A; Fueki, K, Polym. Deg. Stab., 16, 13-24, 1986.
<b>TOXICITY</b>			
NFPA: Health, Flammability, Reactivity rating	-	1/1/0	

## SMAA poly(styrene-co-methylmethacrylate)

PARAMETER	UNIT	VALUE	REFERENCES
Carcinogenic effect	-	not listed by ACGIH, NIOSH, NTP	
<b>PROCESSING</b>			
Typical processing methods	-	injection molding	
Preprocess drying: temperature/ time/residual moisture	°C/h/%	75-82/2/	
Processing temperature	°C	182-243	
Processing pressure	MPa	0.7 (back)	
Applications	-	appliances, bathroom accessories, decorative displays, medical, toys	
Outstanding properties	-	sterizable (EtO, radiation), high clarity	
<b>BLENDS</b>			
Suitable polymers	-	PMMA, PS, SAN, SMA	
<b>ANALYSIS</b>			
FTIR (wavenumber-assignment)	cm <sup>-1</sup> /-	C=O – 1730; phenyl – 1493; OH - 3400	Torikai, A; Hozumi, A; Fueki, K, Polym. Deg. Stab., 16, 13-24, 1986.
Raman (wavenumber- assignment)	cm <sup>-1</sup> /-	vinyl – 1600-1675; C=O – 1675-1750	Corona-Rivera, M A; Flores, J; Puig, J E; Mendizabal, E, Polym. Eng. Sci., 49, 2125-31, 2009.