HPC hydroxypropyl cellulose

PARAMETER	UNIT	VALUE	REFERENCES
GENERAL			
Common name	-	hydroxypropyl cellulose	
CAS name	-	cellulose 2-hydroxypropyl ether	
Acronym	-	HPC	
CAS number	-	9004-64-2	
RTECS number	-	NF9050000	
HISTORY			
Person to discover	-	Hagedorn, M; Moeller, P	Hagedorn, M; Moeller, P, US Patent 1,994,038, IG Farben, Mar. 12, 1935.
Date	-	1935 (German application 1929)	
Details	-	technology of production patented	
SYNTHESIS			
Monomer(s) structure	-	cellulose, C_3H_6O	
Monomer(s) CAS number(s)	-	9004-34-6; 75-56-9	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	160,000-560,000; 58.08	
Method of synthesis	-	cellulose is converted to alkali cellulose by reacting it with sodium hydroxide solution, subsequently, propylene oxide is used to obtain final product	
Maximum degree of substitution	%	26-66	Lopez-Velazquez, D; Hernandez-Sosa, A R; Perez, E, Carbohydrate Polym., 125, 224-31, 2015.
Mass average molecular weight, M_w	dalton, g/mol, amu	11,700-910,0000	
Radius of gyration	nm	33	Nilsson, S; Sundelof, L-O; Porsch, Carbohydrate Polym., 28, 265-75, 1995.
STRUCTURE			
Crystallinity	%	18.3-20.6	Matsuoo, M; Yanagida, N, Polymer, 32, 14, 2561-76, 1991.
Cell type (lattice)	-	tetragonal	Samuels, R J, J. Polym. Sci., A-2, 7, 1197, 1969.
Cell dimensions	nm	a:b:c=1.13:1.13:1.50	Samuels, R J, J. Polym. Sci., A-2, 7, 1197, 1969.
Number of chains per unit cell	-	2	Samuels, R J, J. Polym. Sci., A-2, 7, 1197, 1969.
Chain conformation	-	3/1 helix	Samuels, R J, J. Polym. Sci., A-2, 7, 1197, 1969.
COMMERCIAL POLYMERS			
Some manufacturers	-	Hercules	
Trade names	-	Klucel	
PHYSICAL PROPERTIES			
Density at 20°C	g cm^{-3}	1.17-1.21; 1.09 (amorphous); 2.05 (crystalline)	
Bulk density at 20°C	g cm^{-3}	0.29-0.40	
Color	-	white to off-white	
Refractive index, 20°C	-	1.3370	

HPC hydroxypropyl cellulose

PARAMETER	UNIT	VALUE	REFERENCES
Odor	-	odorless	
Melting temperature, DSC	°C	189-211	
Softening point	°C	130	
Glass transition temperature	°C	-4.2 to -7.0; 21-43	Lopez-Velazquez, D; Hernandez-Sosa, A R; Perez, E, Carbohydrate Polym., 125, 224-31, 2015.
Heat of fusion	kJ mol^{-1}	10.6	
Surface tension	mN m^{-1}	43.6	
Diffusion coefficient of water vapor	cm^2 s^{-1} x10^8	2.83	Yanagida, N; Matsuo, M, Polymer, 33, 5, 996-1005, 1992.
MECHANICAL & RHEOLOGICAL PROPERTIES			
Tensile strength	MPa	14-24	
Tensile modulus	MPa	400-1,200	
Tensile stress at yield	MPa	16	
Elongation	%	31	
Elastic modulus	MPa	1,200 (dry); 300 (8% water)	Yakimets, I; Wellner, N; Smith, A C; Wilson, R H; Farhat, I; Mitchell, J, Mechanics Mater., 39, 500-12, 2007.
Young's modulus	MPa	700	Yanagida, N; Matsuo, M, Polymer, 33, 5, 996-1005, 1992.
Moisture absorption, equilibrium 23°C/50% RH	%	4	
CHEMICAL RESISTANCE			
Acid dilute/concentrated	-	non-resistant	
Alcohols	-	soluble	
Aromatic hydrocarbons	-	insoluble	
Esters	-	insoluble	
Greases & oils	-	insoluble	
Halogenated hydrocarbons	-	soluble	
Ketones	-	soluble	
Good solvent	-	cellosolve, dioxane, ethanol, methanol, water	
Non-solvent	-	aliphatic hydrocarbons, benzene, carbon tetrachloride, toluene	
FLAMMABILITY			
Autoignition temperature	°C	400	
TOXICITY			
NFPA: Health, Flammability, Reactivity rating	-	2-1/1-0/0	
Carcinogenic effect	-	not listed by ACGIH, NIOSH, NTP	
OSHA	mg m^{-3}/ ppm	n/a	
Oral rat, LD_{50}	mg kg^{-1}	10,200	
PROCESSING			
Typical processing methods	-	blow molding, compression molding, extrusion, injection molding	

HPC hydroxypropyl cellulose

PARAMETER	UNIT	VALUE	REFERENCES
Applications	-	adhesives, aerosols, coatings, cosmetics, encapsulation, extrusion (film and sheet), fibers, foods, paper, pharmaceuticals (controlled release matrix, film coating, tablet binder), textile printing	
BLENDS			
Suitable polymers	-	acrylics, PAA, PVDF	