



Proven Performance—  
New Solutions



# UCAR™ Solution Vinyl Resins

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Through advanced solution  
vinyl resin technology,

The Dow Chemical Company  
is extending 50 years of proven  
performance into a new realm  
of leadership, offering new  
solutions to application  
needs with the use of UCAR™  
Solution Vinyl Resin products.

## UCAR™ Solution Vinyl Resins

UCAR™ Solution Vinyl Resins, produced by a proprietary solution polymerization process, offer several advantages:

- Outstanding water resistance. No water-soluble suspending agents or surfactants are used in the manufacture.
- Uniform polymer composition and narrow molecular weight distribution. Provides predictable solution viscosity and batch-to-batch production uniformity.
- Good solubility. Easily dissolved, and low in gels and insoluble materials.
- Compatibility. All UCAR™ Solution Vinyl Resins are completely compatible with each other and with many different types of resins.
- Recoatable. Since UCAR™ Solution Vinyl Resins typically dry by evaporation, hydroxyl-modified vinyls can be cured by crosslinking.



## Typical Properties of UCAR™ Solution Vinyl Resins†

Appearance	White Powder
Particle Size % by wt, min, through 20 mesh	98
Bulk Density, lb/ft <sup>3</sup>	24 to 34
Heat Loss, % by wt, max	3.0
Water Content, % by wt, max	0.5
Melting Point, °C	93 to 135

† The physical property data listed here are considered to be typical properties, not specifications.

## Copolymer Types

UCAR™ Solution Vinyl Resins are available in several general copolymer types, as powders and solutions, in a range of molecular weights and compositions.

- Vinyl Chloride/Vinyl Acetate
- Carboxyl-Modified Vinyl Chloride/Vinyl Acetate
- Epoxy-Modified Vinyl Chloride/Vinyl Acetate
- Hydroxyl-Modified Vinyl Chloride/Vinyl Acetate
- Carboxyl-Modified/Hydroxyl-Modified Vinyl Chloride/Vinyl Acetate
- Water-Based Vinyl Copolymer
- Sulfonate-Modified Vinyl Chloride/Vinyl Acetate

## Opportunities through New Solutions

Multiple characteristics and properties exist within the product range, suggesting new opportunities and application solutions.

- Vinyl chloride contributes strength and toughness, as well as water and chemical resistance.
- Vinyl acetate improves solubility and flexibility.
- Hydroxyl modification improves compatibility and adhesion, and provides a site for crosslinking.
- Epoxy modification provides the ability to crosslink with carboxyl-modified vinyl resins to give an all-vinyl reactive system that yields thermoset-like characteristics; most notably, improved toughness, enhanced physical properties, and superior chemical resistance.
- Carboxyl modification provides excellent adhesion to metals.
- Sulfonate modification provides excellent pigment dispersing characteristics.



**Table 1A—Typical Properties of UCAR™ Solution Vinyl Resins†**

UCAR™ Solution Vinyl Resins						
	VYNS-3	VYHH	VYHD	VMCH	VMCC	VMCA
Polymer Composition % by Wt						
VCI	90	86	86	86	83	81
VAc	10	14	14	13	16	17
Other	—	—	—	1 <sup>a</sup>	1 <sup>a</sup>	2 <sup>a</sup>
Reactive Functionality						
Type	—	—	—	carboxyl	carboxyl	carboxyl
% by Wt	—	—	—	1.0	1.0	2.0
Acid No.	—	—	—	10	10	19
Hydroxyl Value	—	—	—	—	—	—
Epoxy Equivalent Wt	—	—	—	—	—	—
Inherent Viscosity ASTM-D1243	0.74	0.50	0.40	0.50	0.38	0.32
Specific Gravity ASTM-D792	1.36	1.35	1.35	1.35	1.34	1.34
Glass Transition Temp. (T <sub>g</sub> ), °C	79	72	72	74	72	70
Average Molecular Wt, Mn <sup>b</sup>	44,000	27,000	22,000	27,000	19,000	15,000
Solution Viscosity <sup>c</sup> at 25°C, cP	1300 <sup>d</sup>	600	200	650	100	55
Typical Solution Properties						
Solids, % by Wt	15	20	25	20	25	30
MEK/Toluene	67/33	50/50	33/67	50/50	25/75	25/75
Viscosity at 25°C, cP	250	200	175	150	250	370

(a) Maleic acid

(b) Referenced to polystyrene standard.

(c) 30% resin in MEK

(d) 20% resin in MEK

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**Table 1B—Typical Properties of UCAR™ Solution Vinyl Resins†**

	UCAR™ Solution Vinyl Resins					UCARMAG™ Binder		Waterborne Dispersion <sup>h</sup> AW-875
	VAGH	VAGD	VAGF	VAGC	VROH	527	569	
	Polymer Composition % by Wt							
VCI	90	90	81	81	81	82	85	N/A
VAc	4	4	4	4	4	4	13	N/A
Other	6 <sup>b</sup>	6 <sup>b</sup>	15 <sup>c</sup>	15 <sup>c</sup>	15 <sup>c</sup>	14 <sup>a,c</sup>	2 <sup>d</sup>	N/A
Reactive Functionality Type	hydroxyl	hydroxyl	hydroxyl	hydroxyl	hydroxyl	hydroxyl/ carboxyl	sulfonate	hydroxyl/ carboxyl
% by Wt	2.3	2.3	1.8	1.9	2.0	2.0	1.0	N/A
Acid No.	—	—	—	—	—	—	—	75
Hydroxyl Value	76	76	59	63	66	59	—	56
Epoxy Equivalent Wt	—	—	—	—	—	—	—	—
Inherent Viscosity ASTM-D1243	0.53	0.44	0.56	0.44	0.30	0.56	0.33	N/A
Specific Gravity ASTM-D792	1.39	1.39	1.37	1.36	1.37	1.37	1.35	1.32
Glass Transition Temp. (T <sub>g</sub> ), °C	79	77	70	65	65	72	72	80
Average Molecular Wt, Mn <sup>e</sup>	27,000	22,000	33,000	24,000	15,000	35,000	17,000	24,000
Solution Viscosity <sup>f</sup> at 25°C, cP	1,000	400	930	275	70	720	850	N/A
Typical Solution Properties								
Solids, % by Wt	20	25	20	30	30	20	20	39
MEK/Toluene	50/50	50/50	50/50	50/50	25/75	50/50	50/50	N/A
Viscosity at 25°C, cP	350	400	171	184	340	170	500	160

(a) Maleic acid

(b) Vinyl alcohol

(c) Hydroxyalkyl acrylate

(d) Sulfonate-containing monomer

(e) Referenced to polystyrene standard.

(f) 30% resin in MEK

(g) On solids

(h) The dispersion is surfactant-free, pH 6.7–7.7, with particle size about 0.08 microns. The water content is 61% by Wt. The neutralant is DMEA.

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For more information about UCAR™ Solution Vinyl Resins,

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