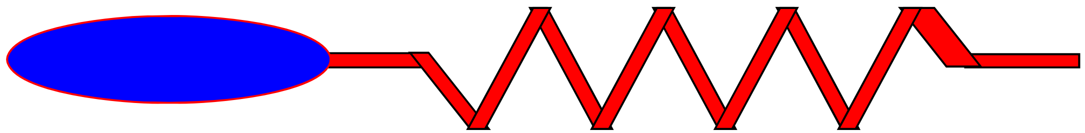
HIGH MOLAR VOLUME (HMV) POLYMER

Introduction:
Green Technology

➢One of the newer technologies is using **renewable resources** as basis for surfactant formulating



Surfactant: hydrophilic / hydrophobic part in same mol.

Classical hydrophobe	Renewable hydrophobe
Linear synthetic alkyl (stearyl, tridecyl), etc.	Castoroil
Branched alkyl (iso-alkyl, 2-ethylhexyl, etc.)	Oleic acid, Linoleic acid
Aromatic	Talloil
Alkylaryl (Alkylphenol)	Sorbate

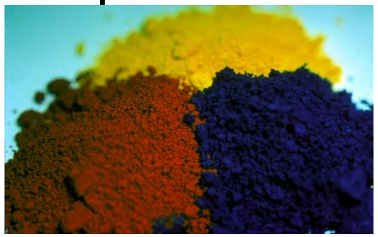
Pigment dispersion technology

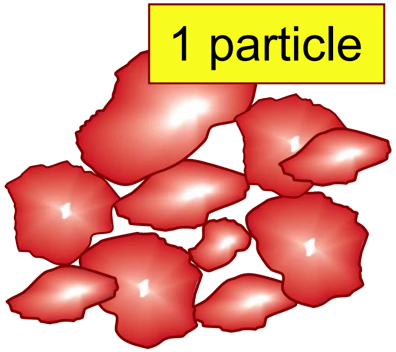
the process….

Agglomerated// flocculated particles

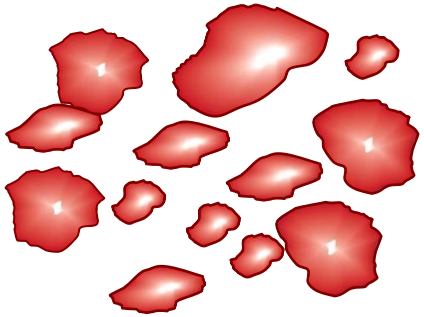
Dispersion

Primary Particles

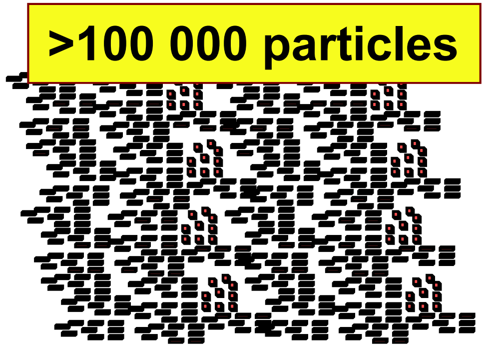




Pigment powder



De-flocculated



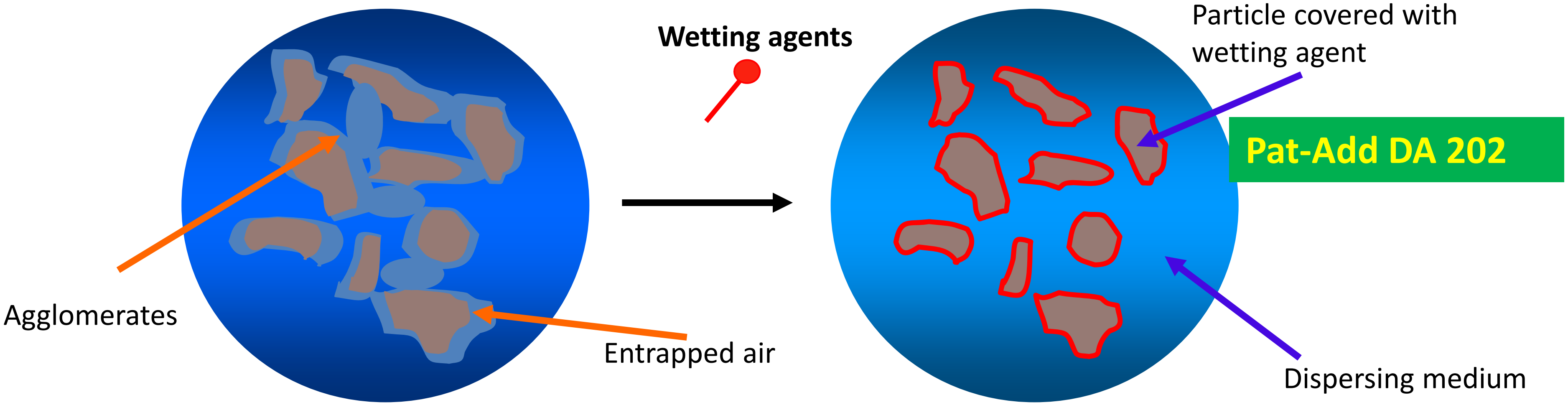
Primary particles

Dispersion process:

1. Wetting
2. De-agglomeration
3. Stabilisation

Pigment dispersion

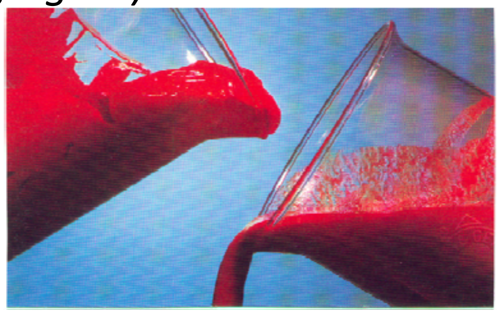
***Pigment dispersion**: during the wetting step, air and moisture occurring on the pigment surface are driven off and replaced by the liquid of the mill-base*



Good wetting (adjusting Surface Tension liquid phase, through wetting agent):

- ✓*enabling high* pigment solids
- ✓low mill-base viscosity
- ✓high milling efficiency

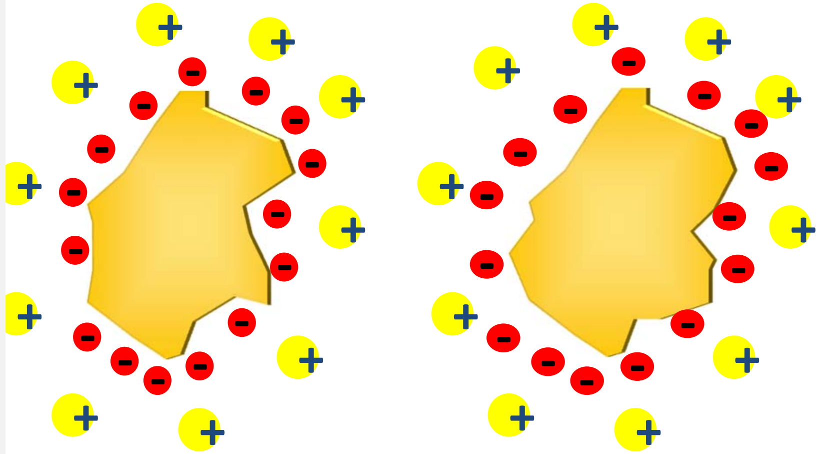
Right: with wetting agent, flowable millbase



Pigment dispersion

Pigment dispersion:
dispersed particles need to be stabilized in order to prevent flocculation, agglomeration, aggregation.
Main stabilisation mechanism for waterborne systems:

Electrostatic repulsion



- Adsorbed polyelectrolytes
- Stabilization efficiency increases with density of electrical double laye
- Additives used for dispersion in waterborne systems are high molecular weight products containing electrical charges in side chains

Waterborne paints & related products

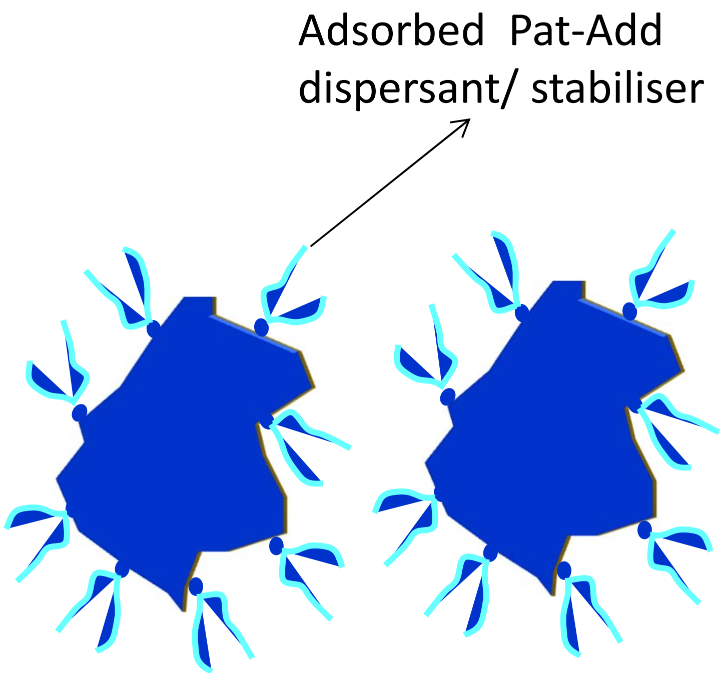
Pigment dispersion

Pigment dispersion:

Main stabilisation mechanism for apolar systems:

Sterical repulsion

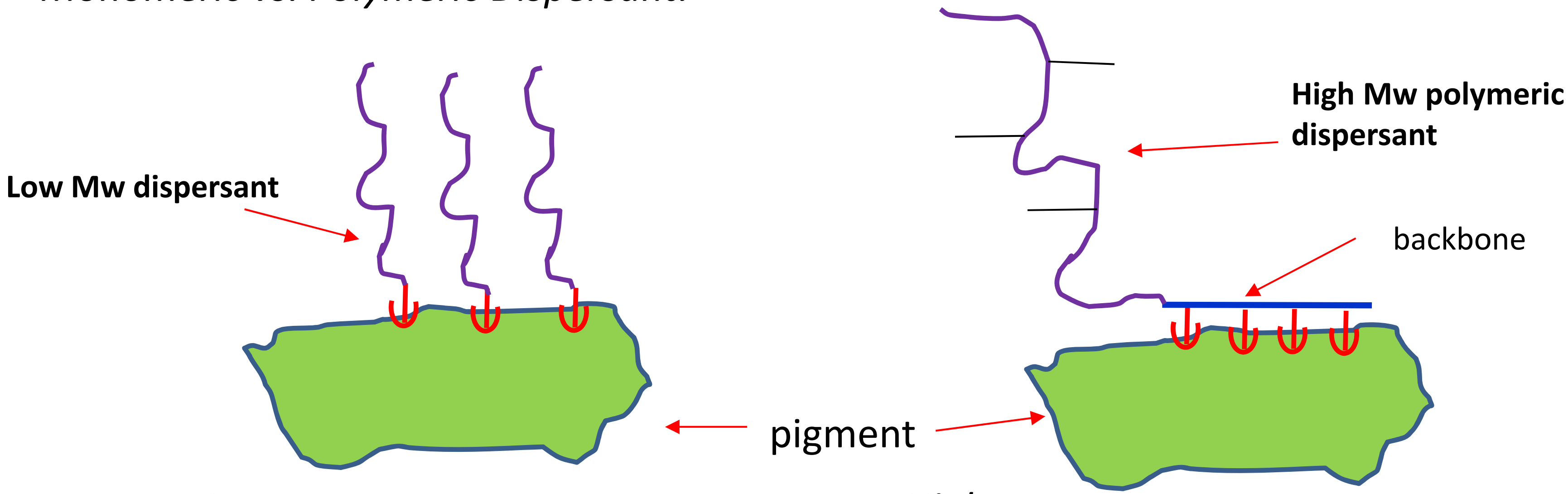
- Additives containing one or more pigment affinic groups providing strong adsoption on pigment surface.
- Resin/solvent compatible chains directed into the surrounding vehicle.



Dominant in solvent borne systems and contributing to waterborne systems

Pigment dispersion

Monomeric vs. Polymeric Dispersant:



Low Mw.:

- Single anchoring
- Open structure
- Fast adsorption
- Fast desorption (f.i. at dilution)
- Poor long-term stabilization
- Example: lecithin, APE,

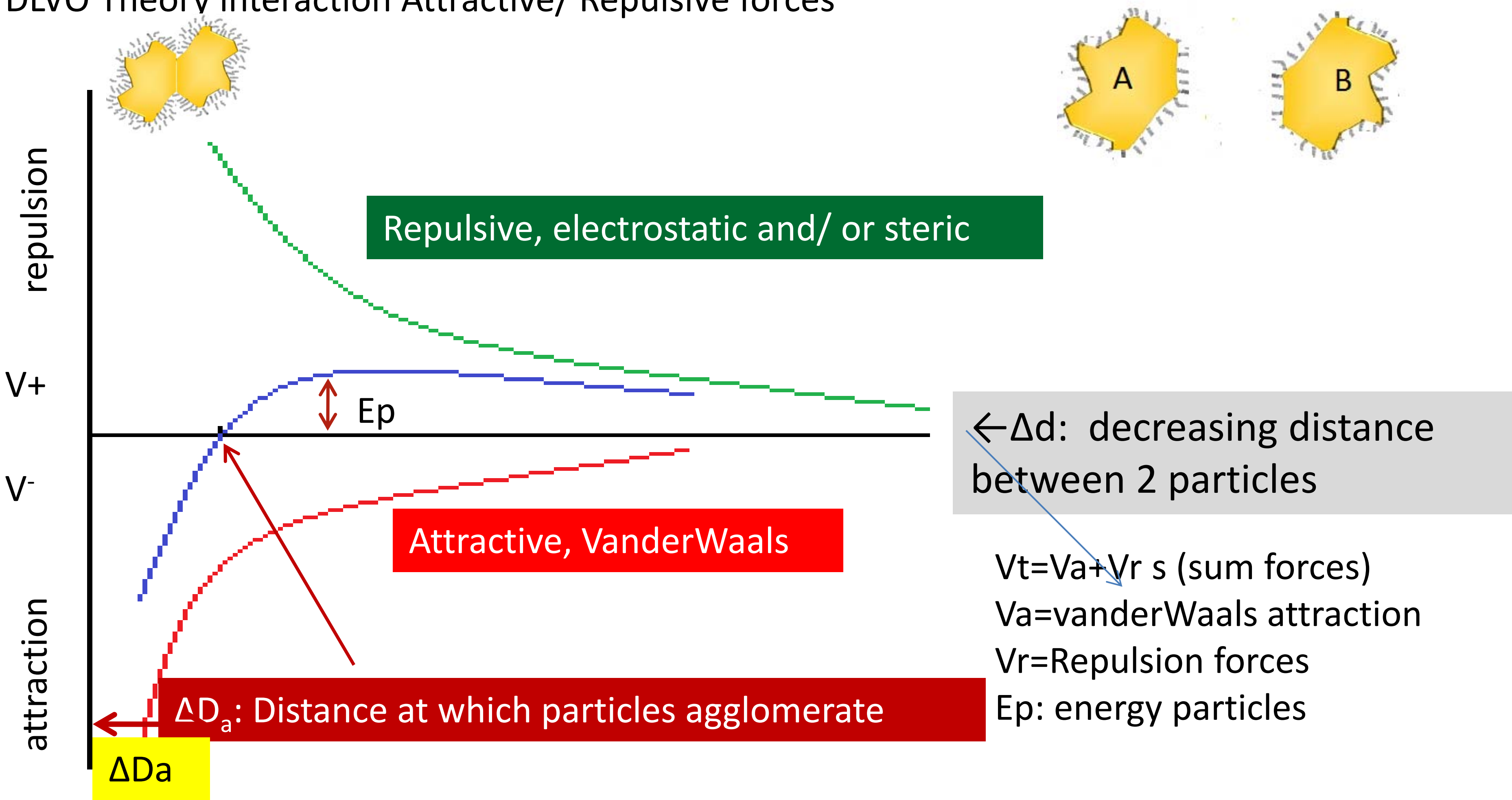
High Mw.:

- Multiple anchoring
- Dense cloud stabilizing dispersant
- Slower adsorption
- Limited risk of desorption
- Excellent stabilisation
- Example: **Pat-Add DA 932**

Pigment dispersion

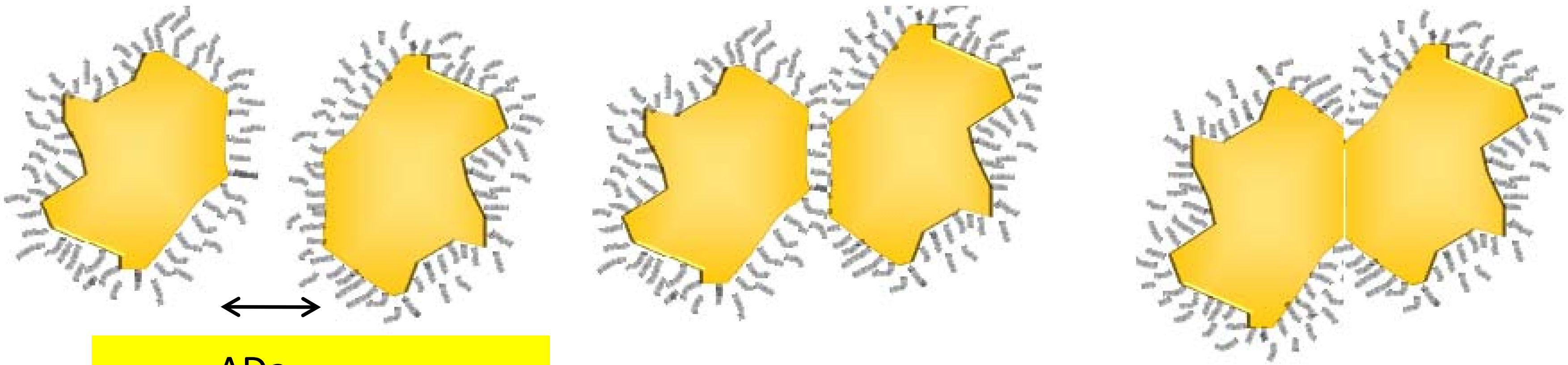
Stabilisation:

DLVO Theory interaction Attractive/ Repulsive forces



Pigment dispersion

Conventional polymeric disersants: low volume per mass



ΔDa:
distance at which particles agglomerate

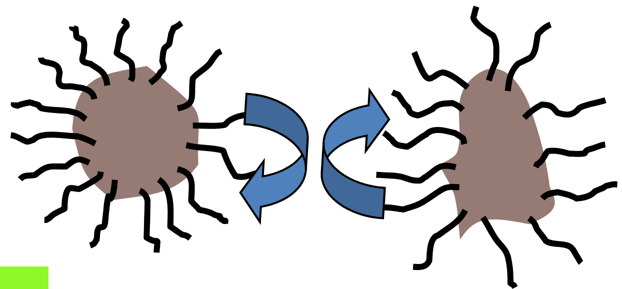
(Relatively) low layer thickness of the adsorbed layer cannot prevent attractive forces to dominate stabilizing forces: **agglomeration**

Pigment dispersion

Volumetric Properties

Patcham unique High Molar Volume (HMV) Polymer technology

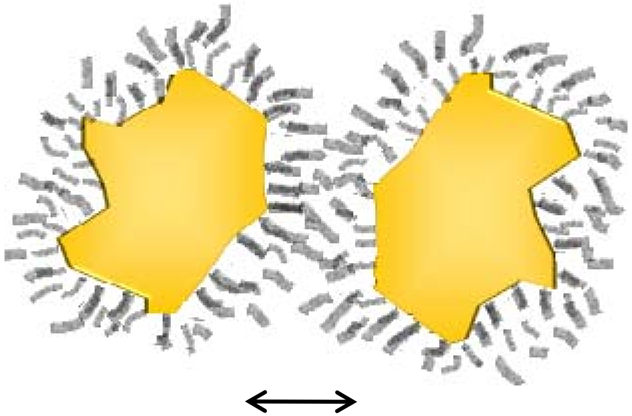
1) Specific and molar volumes
2) Molar volume can be calculated from group contributions
3) Related to Mass and Packaging of matter
4) Molecular mass is sum of mass composing atoms, packing volume is not
5) Packing is influenced by
   a) electronic structure of the atoms in the polymer *[group contribution CH2CH_2 vs. Aryl-gr.: +24% volume /equiv. mass]*
   b) Type of bonding
   c) Structural and spatial variation



Technology used in: Pat-Add DA 900 series

Pigment dispersion

UNIQUE TECHNOLOGY for polymeric dispersants



ΔDa

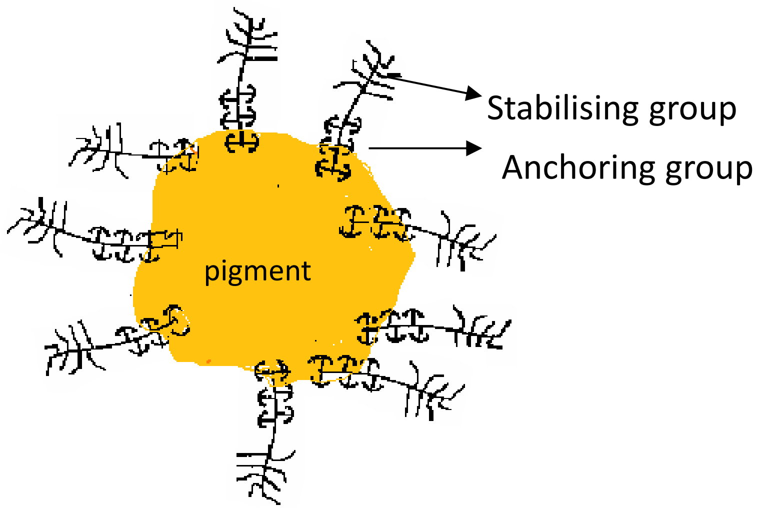
Higher volume contributes to thicker adsorbed layer, preventing attractive forces to dominate stabilizing forces: **stable dispersion!**

Best transparency using Pat-Add DA

Pigment dispersion (Solventborne)

Pat-Add DA 932 polymeric dispersants

- Robust stabilisation
- Multicompatible
- High pigment loadings



Pigment dispersion (Solventborne)

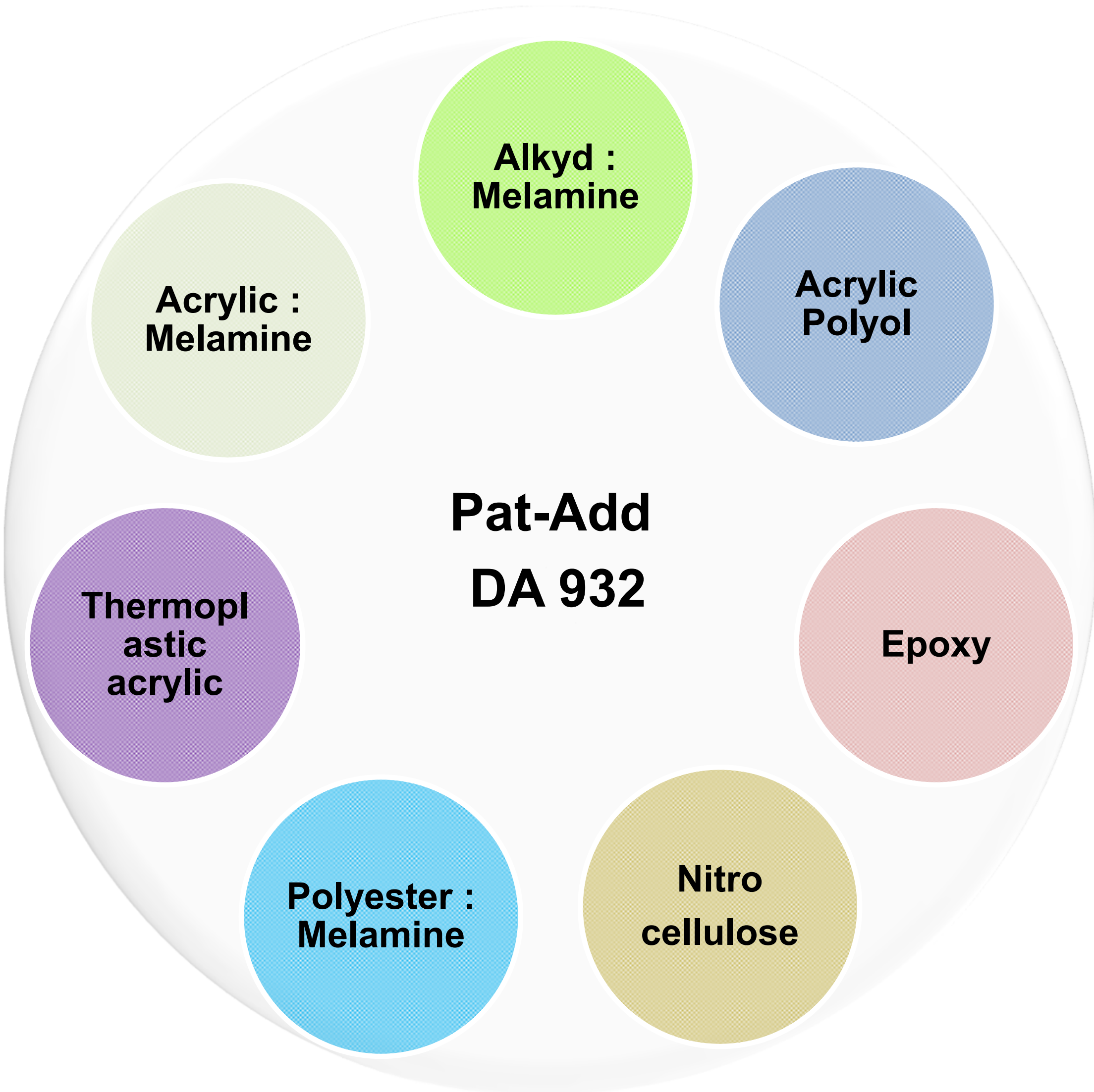
Pat-Add DA 932 polymeric dispersant

Pat-Add DA 932 | **Reference**

Dispersion of HCC Carbon Black: FW 200

Lowest viscosity, best flow, using Pat-Add DA 932

Pat-Add DA 932 Compatibility



High Molar Volume Polymer Technology	
Additive	**End use applications**
Pat-Add DA 932	✓Automotive coatings ✓Resin Minimal and Resin Free Pigment Concentrates ✓Industrial applications ✓Wood coatings
Pat-Add DA 947	✓Coil and Can coatings ✓High bake systems
Pat-Add DA 948	✓Floor coatings ✓Protective coatings ✓High build coatings

Conclusions

- HMV technology provides best compatibility with all solventborne resin systems
- Robust wetting and dispersion capability
- For Resin minimal and Resin free pigment concentrates
- Works with organic, Inorganic and black pigments
- Best stability to the paint systems