



## Technical News No. 03

# EDAPLAN® 490

### Nonionic dispersing agent for waterbased applications

Pigment grinding is by far the most costly and time consuming process during the manufacturing of paints and coatings.

To minimize efforts while preparing a fine and consistent pigment particle distribution the choice of an effective dispersant is very important.

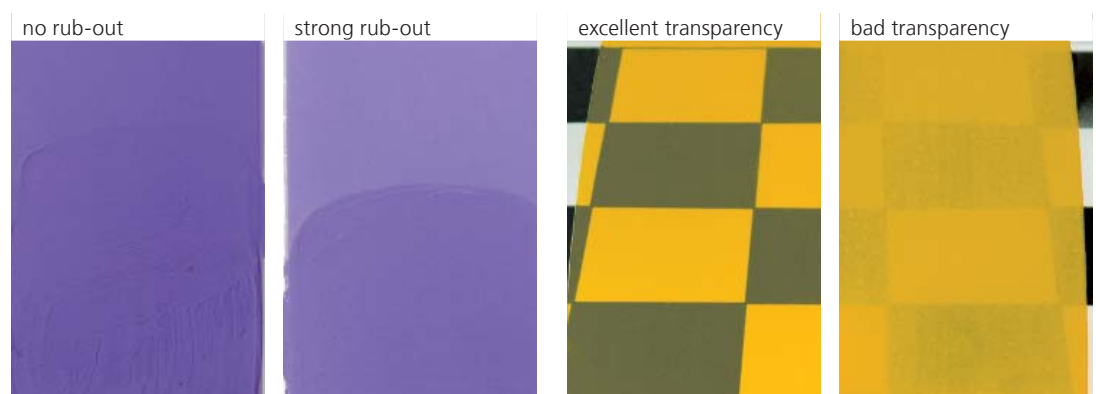
Amongst others a powerful dispersant is characterized by its ability to quickly wet the pigment surface and to permanently adsorb on the same. By doing so the additive creates a kind of protective cover around the particles and prevents them from flocculation. Consequently a perfect stabilization of the dispersed pigments is obtained.

Insufficient stabilization may worst case lead to flocculation or shock effects which result in low colour strength or strong rub-out effects in tinted emulsion paints. In full tone applications or in printing inks gloss and transparency might be reduced or visible pigment specks can be caused (figure 1).

To obtain a most economical and cost-effective grinding process the pigment content in the grind should be maximized. Here again the right choice of the dispersant has a strong influence.

Especially for carbon blacks and organic pigments like yellow or red azo pigments EDAPLAN® 490 leads to a stable pigment dispersion with outstanding optical properties like gloss, colour strength or transparency. In many cases extremely high pigment contents can be achieved with EDAPLAN® 490 at rather low dosage.

**Figure 1**  
Insufficient stabilization of organic pigments  
a) Strong rub-out of PV 23 in an emulsion paint  
b) Bad transparency and formation of specks in a printing ink with PY 83



## Product composition & Properties

EDAPLAN® 490 is a nonionic, high molecular, branched polymer delivered as 40% solution in water.

It is particularly suitable to disperse organic pigments and carbon blacks, however inorganic pigments can be dispersed as well. Optical

properties like gloss, transparency and colour strength are excellent with EDAPLAN® 490. Moreover the product shows an extremely good reduction of viscosity of the grind even at lowest dosage and thus allows a pigment content above average.

**Table 1**  
Characteristics of  
EDAPLAN® 490

	EDAPLAN® 490
<b>Polymer structure</b>	nonionic, high molecular, branched copolymer
<b>Appearance</b>	amber
<b>Active content [%]</b>	40% dissolved in water
<b>Density [g/cm³]</b>	approx. 1
<b>pH</b>	approx. 8
<b>Viscosity</b>	low viscous

## Mechanism of action

During the dispersing process pigment agglomerates are broken and distributed homogeneously in the system by applying mechanical shear force. To avoid re-agglomeration after taking away the shear energy the dispersant forms a kind of protective cover around each single dispersed pigment particle. Thereby it has to be differentiated between electrostatic repulsion and steric hindrance. EDAPLAN® 490's mechanism of action is mainly based on steric stabilization due to its nonionic polymer structure.

To allow steric stabilization efficient polymers usually show two typical properties with regard to their structure.

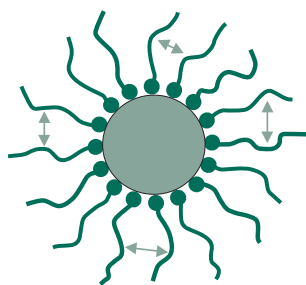
The polymer needs to contain one or more pigment affine groups which can durable accumulate on the surface of the dispersed particle and

will not be removed by other ingredients of paint and coating formulations. Components like binders, wetting agents or solvents usually also contain a certain pigment affinity and might compete with the dispersant covering the pigment surface.

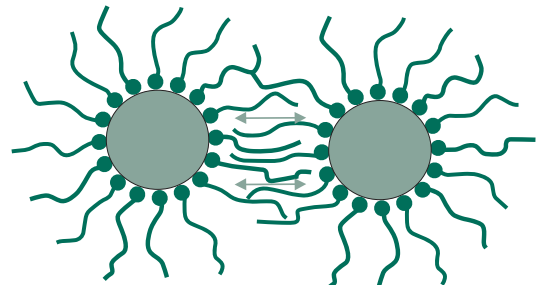
Another characteristic feature are high molecular structures that are particularly compatible with binders and solvents. After adsorption on the pigment surface the molecular chains widely extend into the surrounding media and need a certain space for their room to move freely. During the approach of pigment particles the mobility of the polymer chains is reduced which leads to a loss of entropy. As a consequence a repulsion force results. Hence steric stabilization is also called entropic repulsion (figure 2).

**Figure 2**  
Steric stabilization  
through entropic  
repulsion

free room of motion



entropic repulsion



Those structure characteristics have been considered during the development of EDAPLAN® 490. The hydrophobic parts of the polymer show an extremely strong and lasting interaction with surfaces of organic pigments and carbon blacks. Attraction forces are mainly based on van der Waals and dipole-dipole or donator-acceptor interactions.

The high molecular, hydrophilic polymer structure ensures the steric stabilization and at the same time results in a perfect compatibility with different water dilutable binder systems.

## Results of trials / Guide formulations

Efficient stabilization depends on the occupancy rate of the pigment surface with dispersant. Pigments however vary depending on the producer through their different surface treatments as well as sizes and forms of particles. Consequently the amount of dispersant needs to be

determined individually for each pigment. For some common pigments the ideal dispersant demand has already been determined. Based on that stable binder free pigment concentrates with highest possible pigment content have been formulated (tables 2–4).

	<b>Lysopac Red 7030C</b> (Cappelle) <b>PR 170</b>	<b>Cinilex DPP Red SR2P</b> (CINIC) <b>PR 254</b>	<b>Acetanil Yellow 5 GSH 7412C</b> (Cappelle) <b>PY 74</b>	<b>Diacetanil Yellow HT 8316C</b> (Cappelle) <b>PY 83</b>	<b>Cinilex Yellow SY1H</b> (CINIC) <b>PY 110</b>
<b>Demin. Water</b>	34.75	33.35	35.55	43.15	34.40
<b>AGITAN® 731</b>	0.50	0.50	0.50	0.50	0.50
<b>Acticide MBS</b>	0.10	0.10	0.10	0.10	0.10
<b>EDAPLAN® 490</b>	9.65	11.00	21.25	16.00	15.00
<b>Ammonia (25%)</b>	–	0.05	0.10	0.25	–
<b>Pigment powder</b>	55.00	55.00	42.50	40.00	50.00
<b>%-EDAPLAN® 490 in delivery form calc. on pigment</b>	17.5 %	20%	50%	40 %	30%

**Table 2**

Tables 2–4 Guide formulations for binder-free pigment concentrates with EDAPLAN® 490

	<b>Heuco Red 300203</b> (Heubach) <b>PR 2</b>	<b>Hansa Red R</b> (Clariant) <b>PR 4</b>	<b>Cinilex DPP Orange SJ1C</b> (CINIC) <b>PO 73</b>	<b>Novoperm Orange HL 70</b> (Clariant) <b>PO 36</b>	<b>Bayferrox 3920</b> (Lanxess) <b>PY 42</b>
<b>Demin. Water</b>	37.65	36.15	29.55	34.40	15.20
<b>AGITAN® 731</b>	0.50	0.50	0.50	0.50	0.50
<b>Acticide MBS</b>	0.10	0.10	0.10	0.10	0.10
<b>EDAPLAN® 490</b>	14.25	8.25	24.75	15.00	14.00
<b>Ammonia (25%)</b>	–	0.10	0.10	–	0.20
<b>Pigment powder</b>	47.50	55.00	45.00	50.00	70.00
<b>%-EDAPLAN® 490 in delivery form calc. on pigment</b>	30%	15%	55 %	30%	20%

**Table 3**

**Table 4**

	<b>Bayferrox 130 M</b> (Lanxess)	<b>Kronos 2300</b> (Kronos)	<b>Printex 300</b> (Evonik)	<b>Spezial Black 4</b> (Evonik)
	<b>PR 101</b>	<b>PW 6</b>	<b>Carbon Black</b>	<b>Carbon Black</b>
<b>Demin. Water</b>	15.30	18.75	40.80	50.15
<b>AGITAN® 731</b>	0.50	0.50	0.50	0.50
<b>Acticide MBS</b>	0.10	0.10	0.10	0.10
<b>EDAPLAN® 490</b>	14.00	5.65	13.50	18.00
<b>Ammonia (25%)</b>	0.10	–	0.10	1.25
<b>Pigment powder</b>	70.00	75.00	45.00	30.00
<b>%-EDAPLAN® 490 in delivery form calc. on pigment</b>	20%	7.5%	30%	60 %

## Summary

EDAPLAN® 490 is a high molecular, nonionic dispersing agent which is particularly suitable for organic pigments and carbon blacks but can also disperse inorganic pigments in an excellent way.

Advantages of the use of EDAPLAN® 490 are:

- » very low dosage levels
- » extremely high pigment loading
- » outstanding colour strength
- » high gloss and transparency
- » low viscosity of pigment concentrate