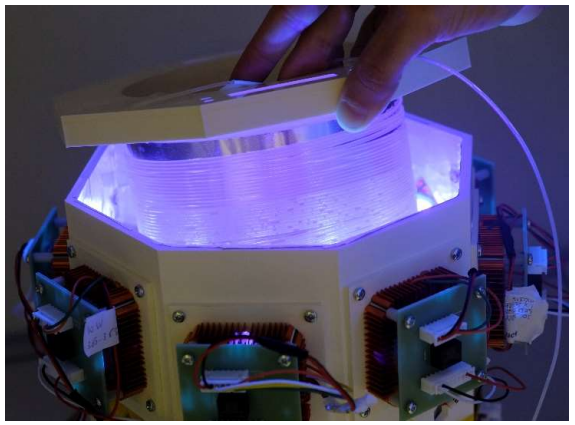
CHEMSTREAM
SUSTAINABLE CHEMISTRY

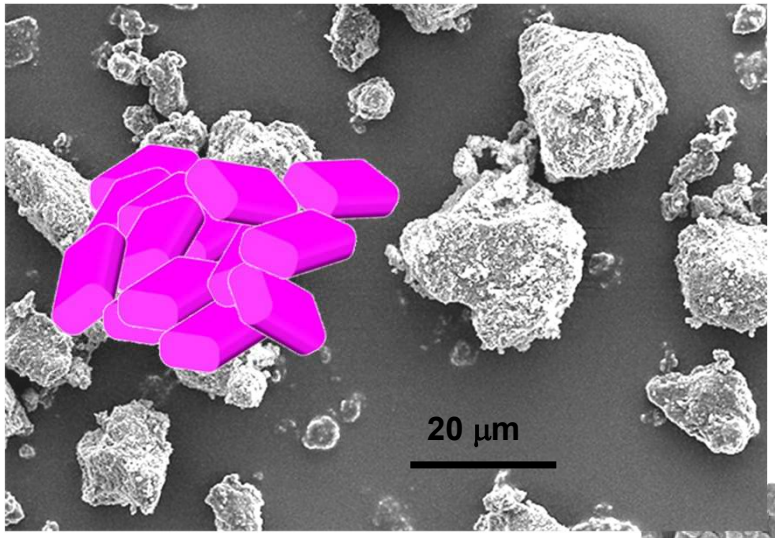
Customized design of dispersing agents: improving inkjet ink reliability and performance

Nils De Vos

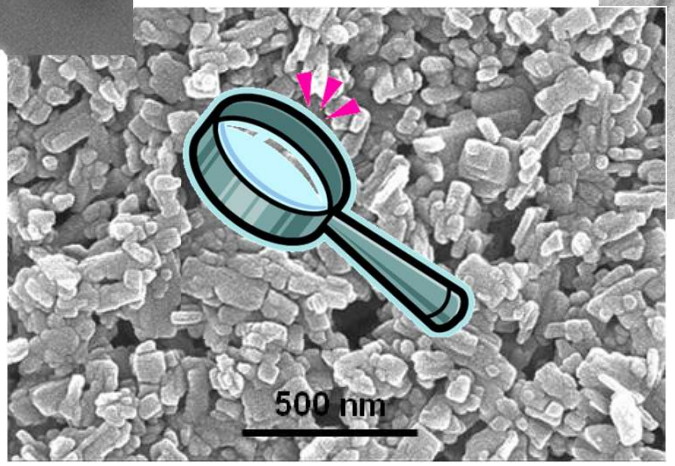
Advanced INKJET TECHNOLOGY 2024

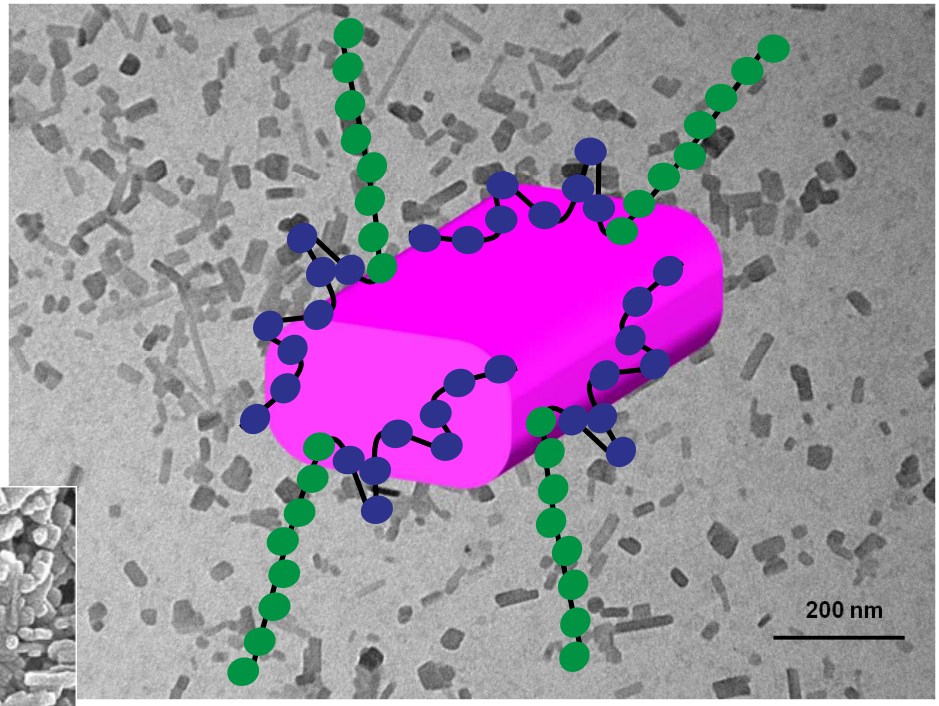


Stabilizing colloidal mixtures: (nano-)dispersions

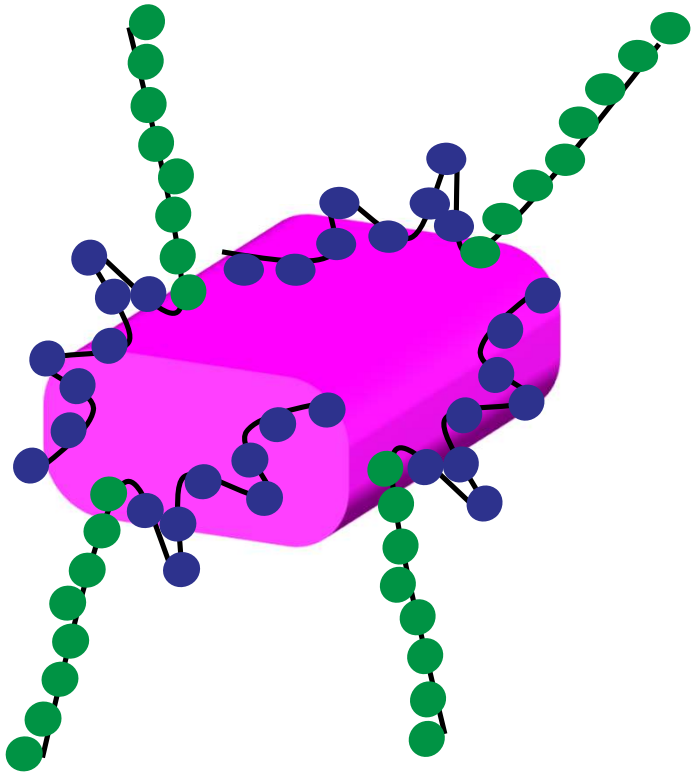


Particle de-agglomeration / de-aggregation





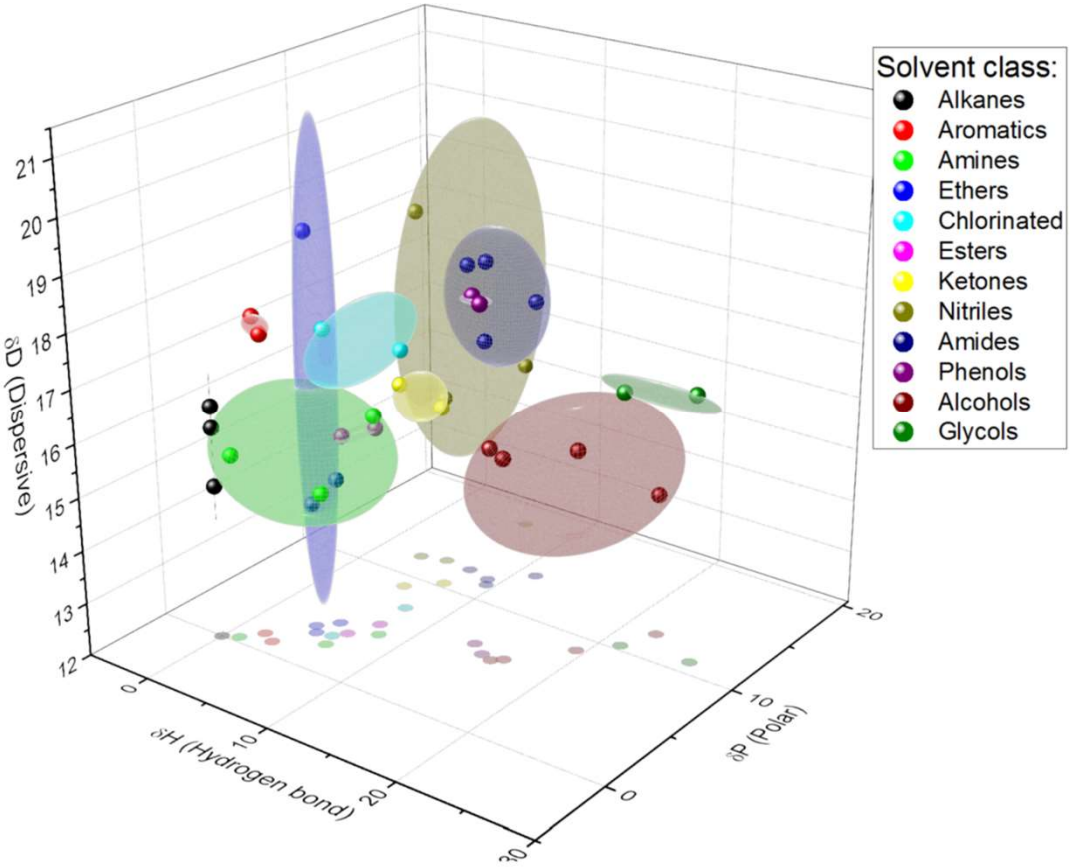
Stabilizing colloidal mixtures: (nano-)dispersions



1. Design the **pigment-anchoring chemistry** of the polymeric dispersing agent or the **pigment/particle surface**
2. Design the **colloidal-stabilizing chemistry** of the polymeric dispersing agent
3. Design the optimal architecture of the polymeric dispersing agent
4. Synthesis of the polymeric dispersing agent / pigment particle surface and optimization via QSAR analysis

Hansen Solubility Parameters: a useful tool

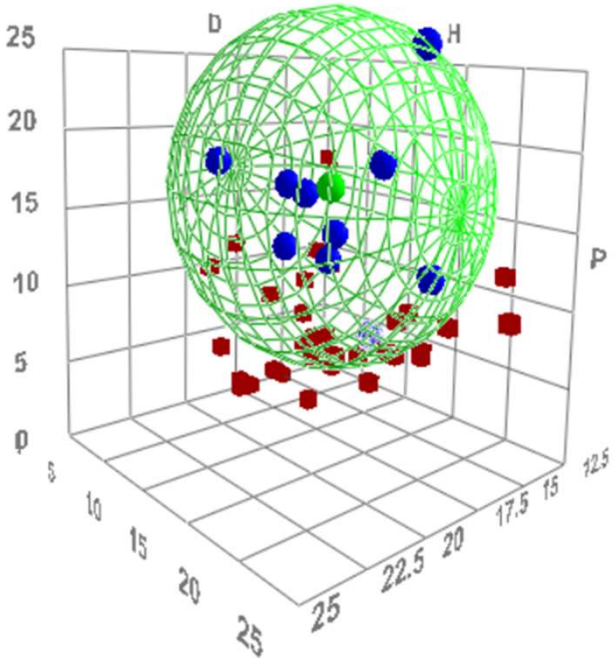
- The idea: ‘similia similibus solvuntur’
- 3 Hansen parameters:
  - δ_d : dispersive or nonpolar interactions (Van der Waals interactions)
  - δ_p : polar interactions (e.g. dipole-dipole interactions)
  - δ_h : hydrogen bonds
- The solubility parameters of Hansen were used for the solvents

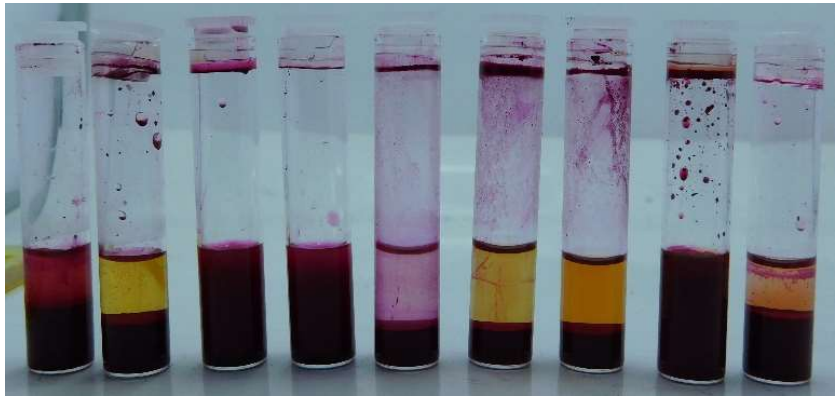


Hansen Solubility Parameters in practice

‘Compatibility’ or ‘Solubility’ are broad terms:

- **Dissolving** (of a powder/drug/compound in solvents)
- **Miscibility** (of solvents)
- **Interaction with substrates** (adhesion)
- **Sedimentation** (of a solid/pigment in solvents)
- **Swelling** (of polymers in solvents)
- …

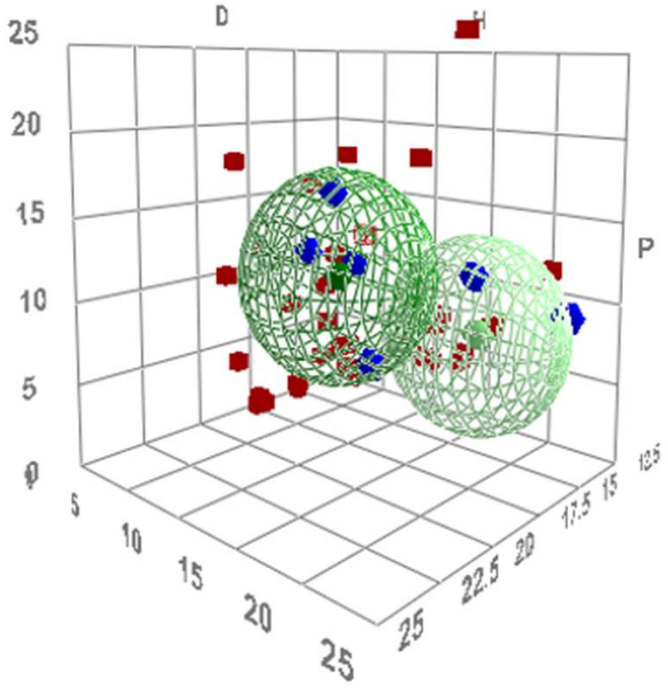


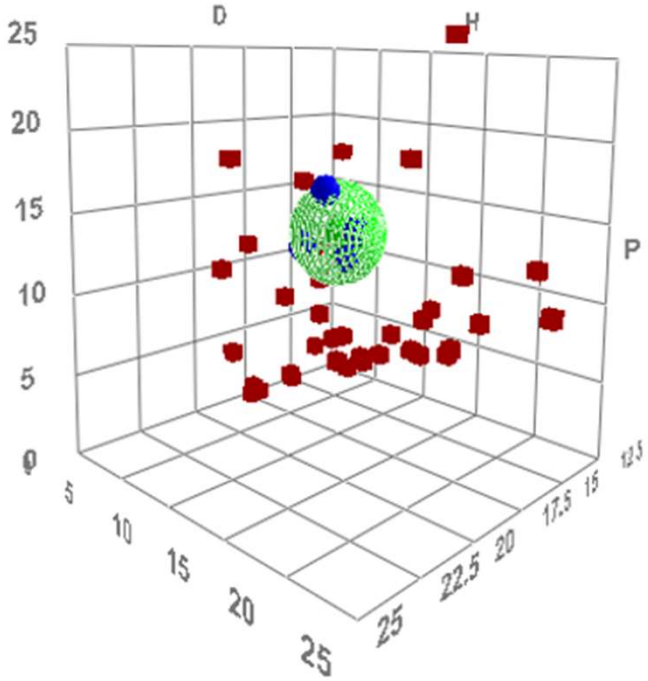


Hansen Solubility Parameters in practice
Pigment screening

Same colour index, very different interaction behaviour

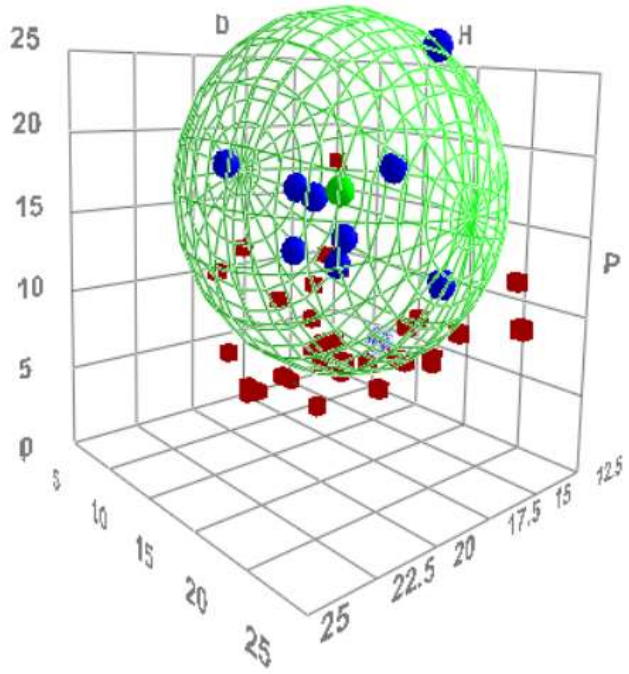
Supplier A





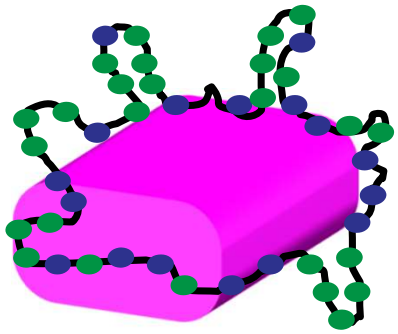
Supplier B

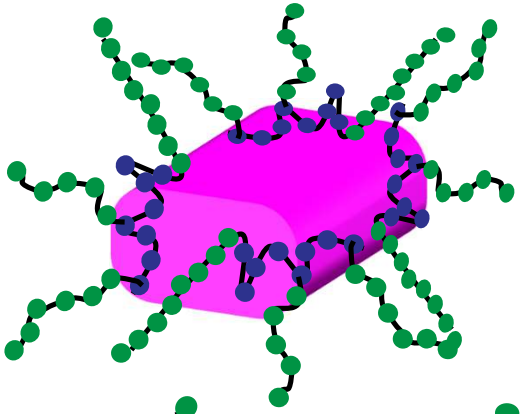
Supplier C



Chemical design of polymers
Architectural choice

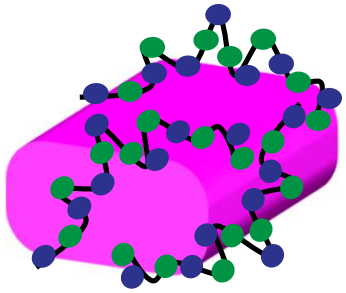
Statistical (random) copolymer

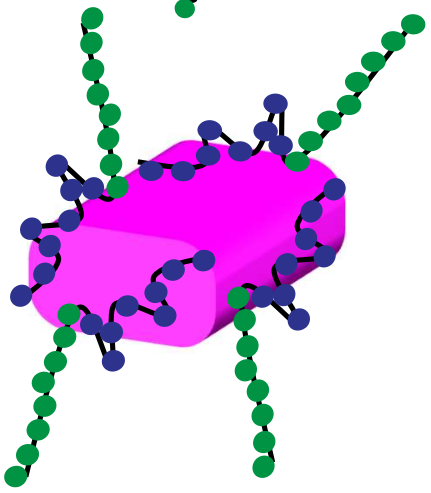




Graft copolymer

Alternating copolymer



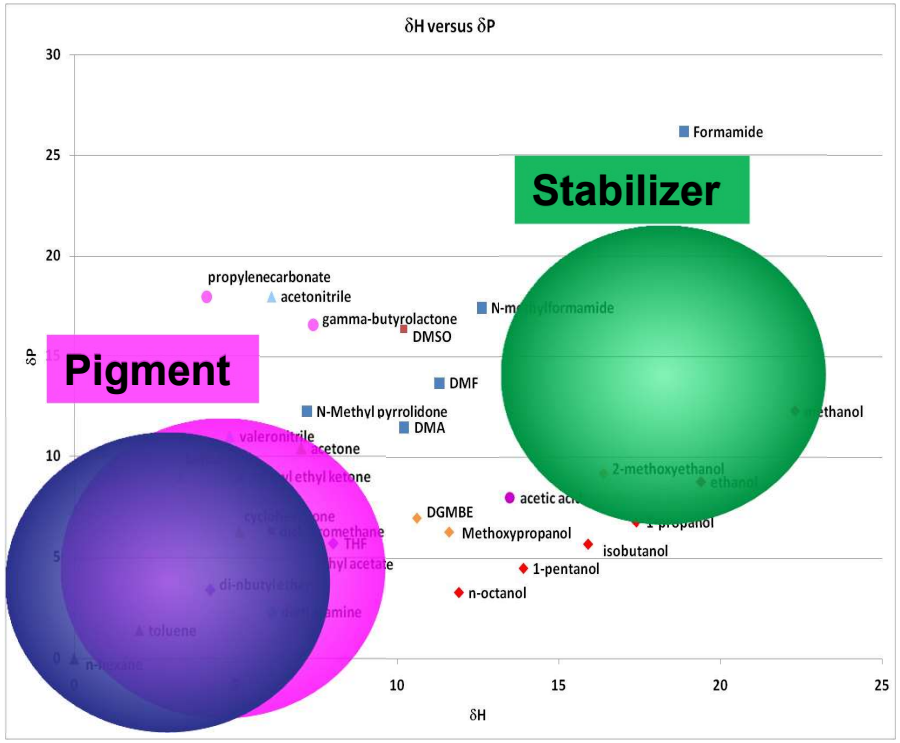


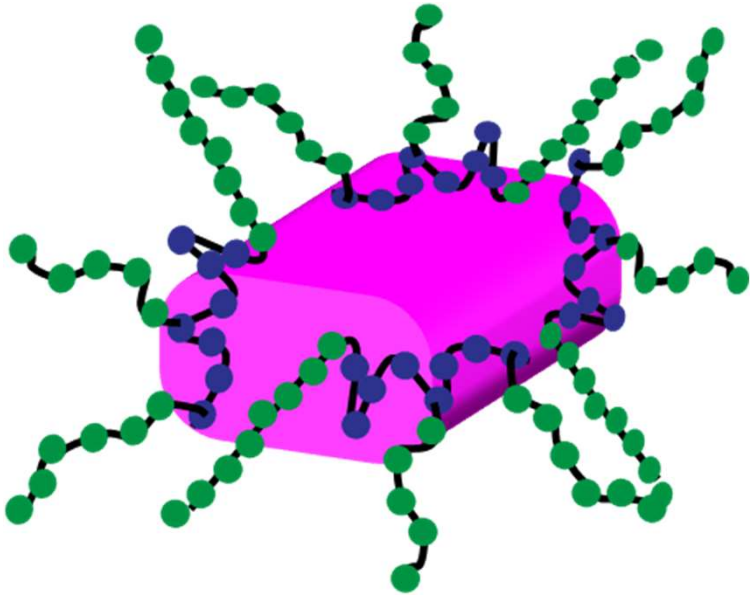
Block copolymer

Putting everything together

Interaction determination between pigment, medium and dispersing agent

Hansen Solubility Parameters



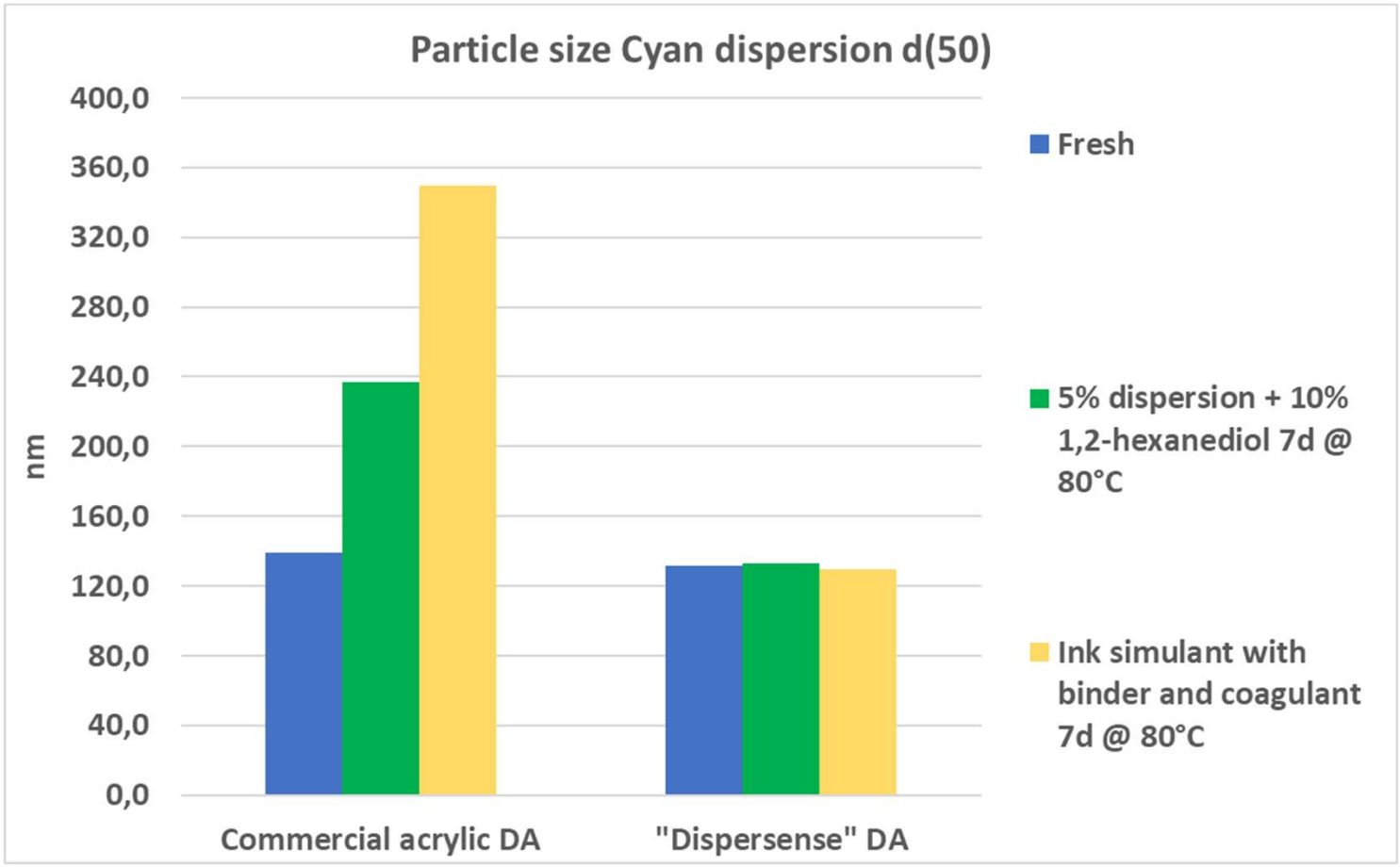


ChemStream products: Dispersense©

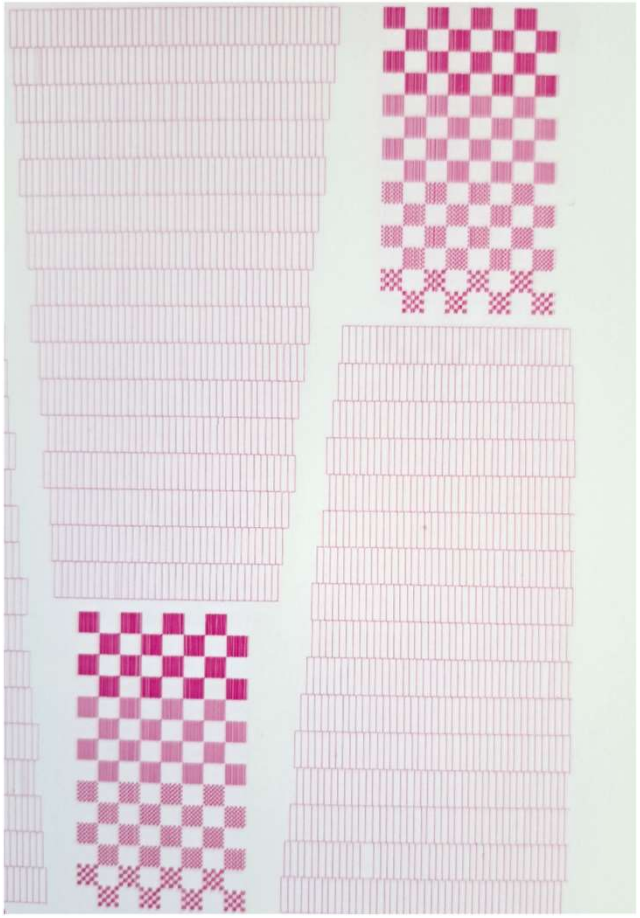
Dispersense©
Water-based dispersants

Due to targeted design

Improved stability in highly demanding water-based inks



Dispersense©
Water-based dispersants



No latency especially in non-throughflow printheads

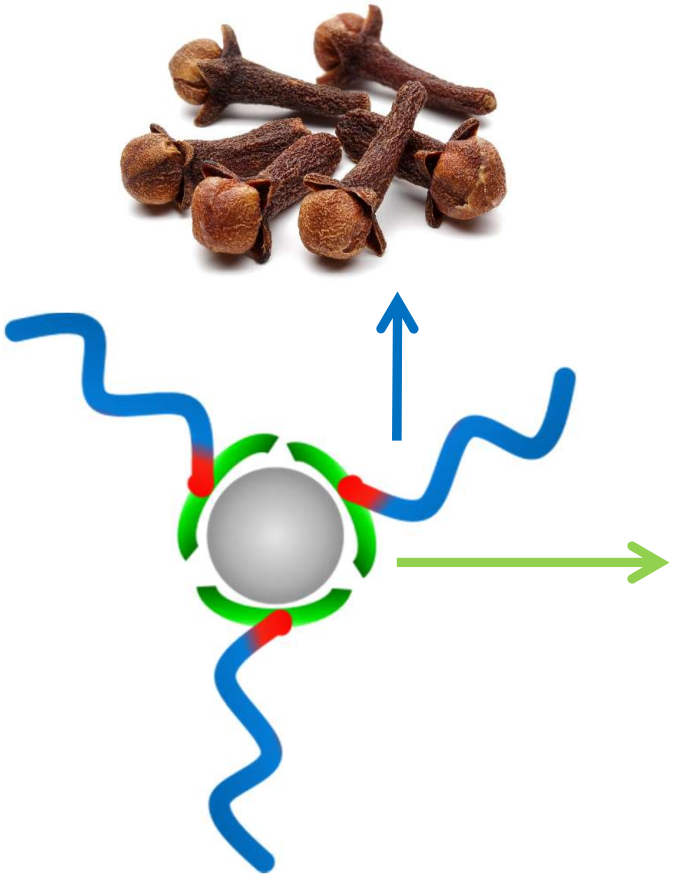
Strongly improved long run printing applications

Highly transparent dispersions and inks

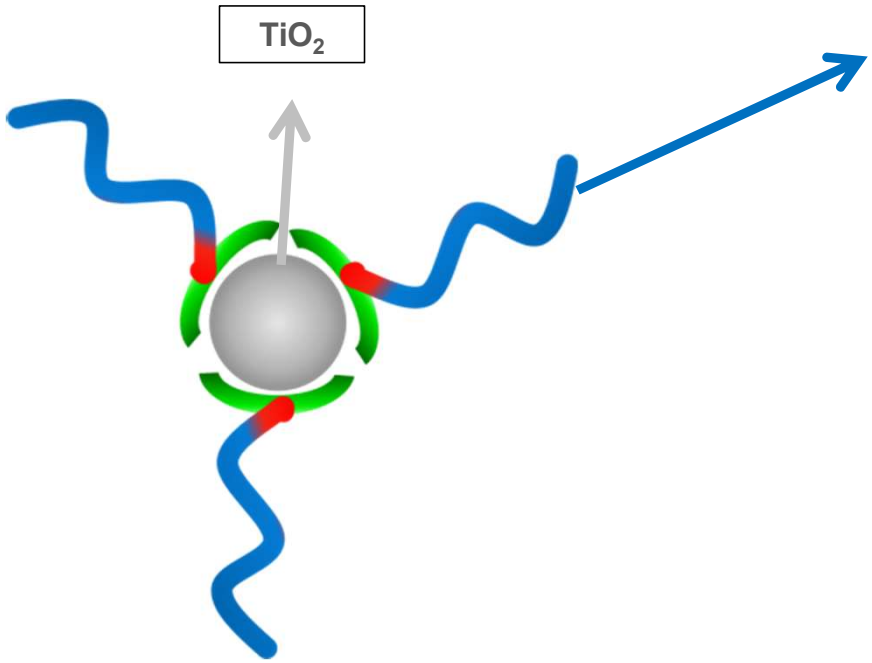
Very good colour strength

Dispersense©: further developments
Bio-based dispersants/emulsifiers

Depolymerization to medium sized Mw's



Dispersense©: further developments
Bio-based dispersants/emulsifiers



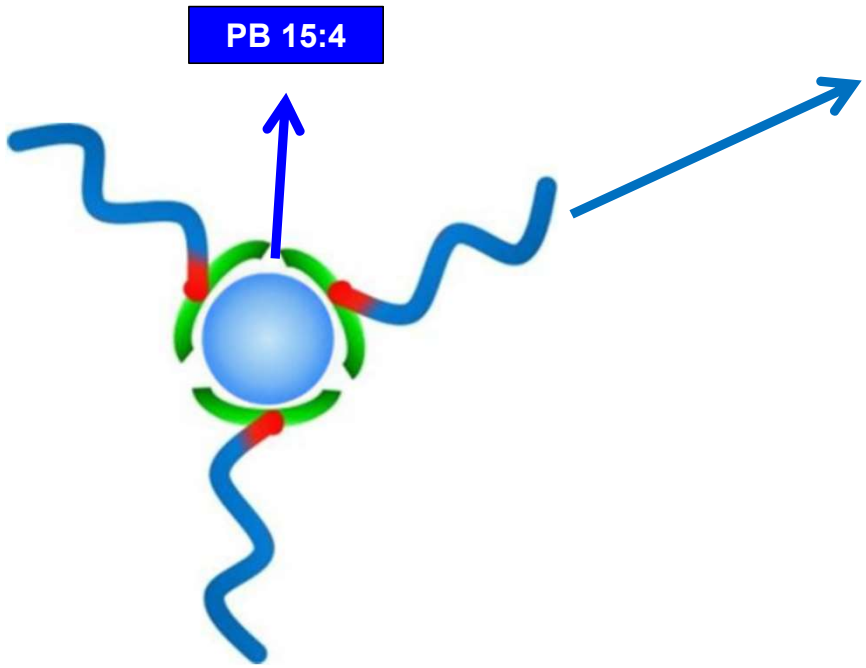
Bio-based dispersing agent

100% bio-based carbon

TiO_2 - Acrylate dispersion

Polymer	Acrylate	DLS (nm)	visco (cP)
DA 1	IBOA	258,3	48,37
DA 2	DPDGA	257,8	32,52
DA 2	IBOA	240,7	30,49

Dispersense©: further developments
Bio-based dispersants/emulsifiers



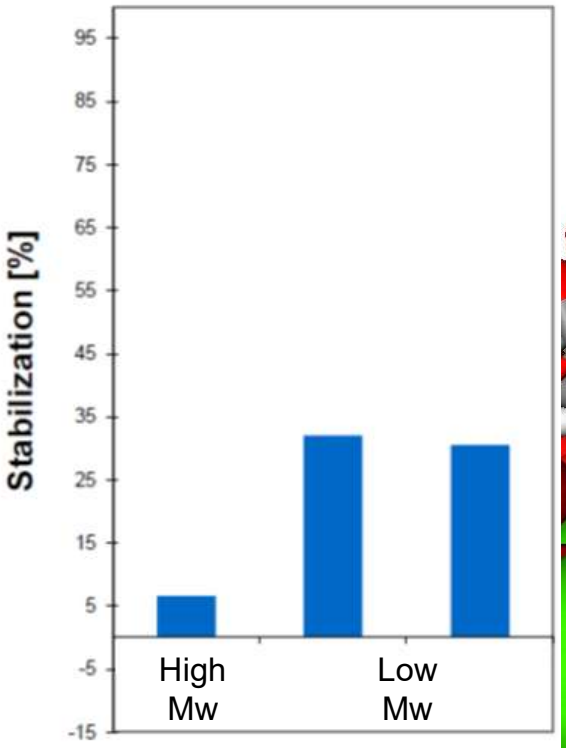
Bio-based dispersing agent

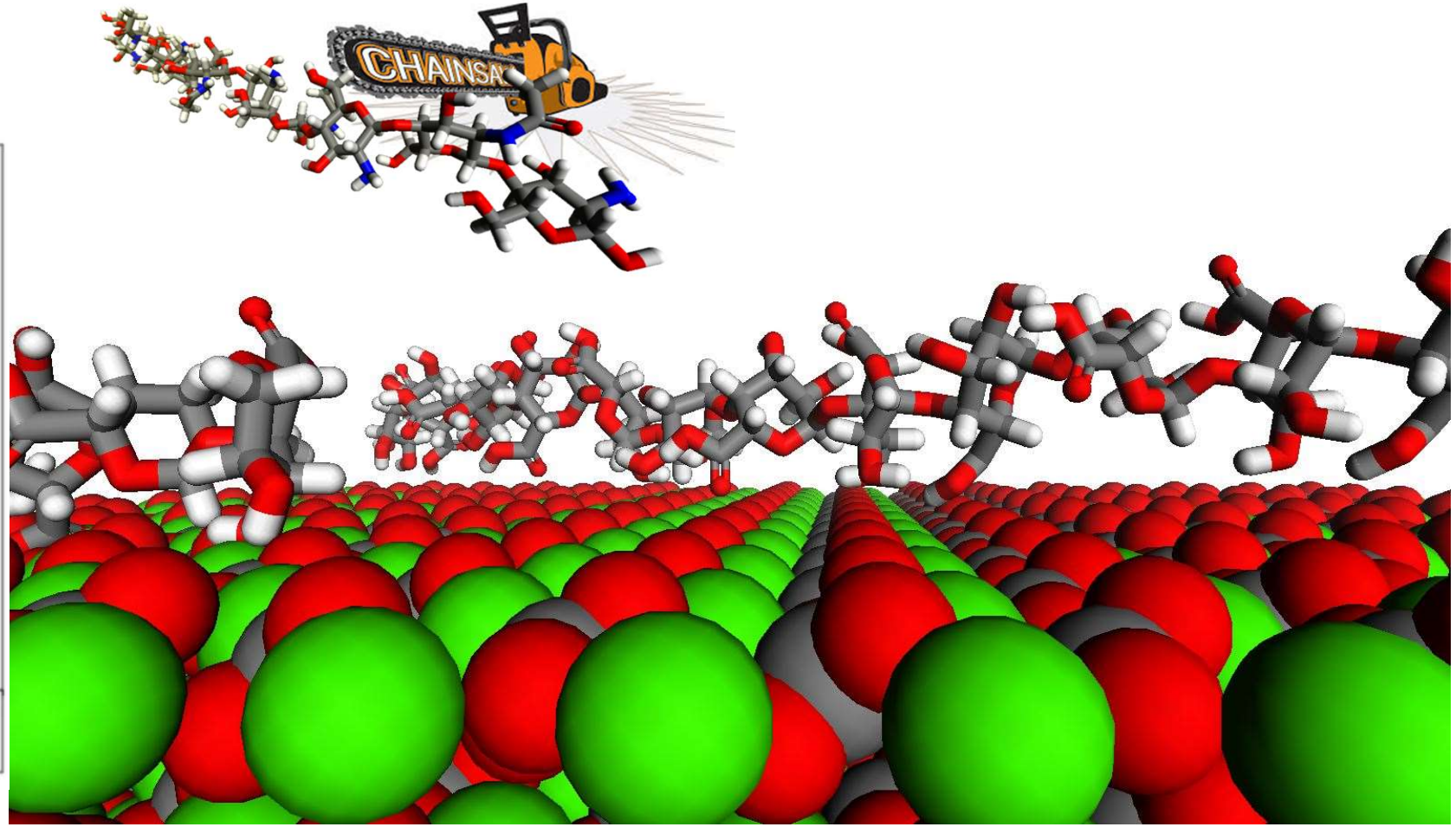
90% bio-based carbon

15% Dispersion made in soybean oil

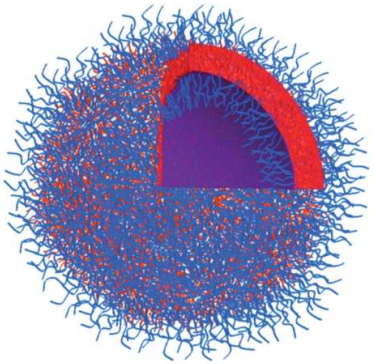
Period	DLS (nm)	visco (cP)
Fresh	108,9	270,2
7d rt	109,1	275,1
28d rt	113,1	258,0
7d 80°C	110,8	262,4

Scale inhibition
Bio-based inhibitors



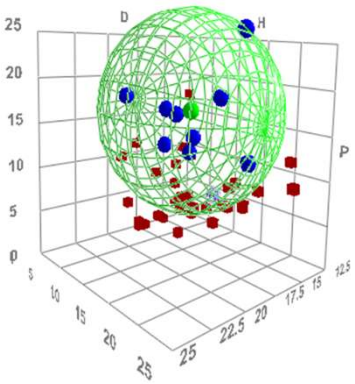


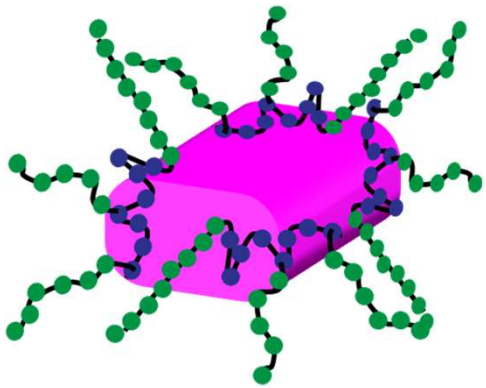
Encapsulation/emulsification
Bio-based encapsulators



Algin oligomers
Pectin oligomers
Chitosan derivatives

Conclusions





Flexible and Versatile

Customized

Towards 100% bio-based

Thanks

… for your attention

You are kindly invited
to our stand for
further questions and discussion

Didn’t have the time or
more questions remaining?
Don’t worry! More info on our website:

www.chemstream.be

Or via info@chemstream.be