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Paints and Coatings

If I can make it there . . .

I'll make it anywhere!

Inks

Plastics

Cleaners

Adhesives

Personal Care

Paints and Coatings

Why Paint?

Coating Technology

The Scientific Balance

Surfactants

Paints and Coatings

Why Paint?

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Surfactants

Why Paint?

- Decorative
- Functional
- Identification
- Miscellaneous
  - Anti-Smudge
  - Anti-Fog
  - Sanitation

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Film Former

Liquid

Pigment

Additives

Coating Technology

Film Former

- Tree Sap, Egg Yolk, Vegetable Oils
- Polymers and Resins
  - Alkyd, Acrylic, Urethane, Epoxy, Polyester, PVA, Silicone, Polyaspartic, Nitrocellulose, VAE, Hydrocarbon Resins, SBR, Oleoresinous, PVB, Fluro Polymers, Versatate, PVDC

Liquid

- Aliphatic, Aromatic, Oxygenated, Water

Coating Technology

Pigments/Fillers

Inorganic

TiO_2, Carbon Black, Metal Oxides

Calcium Carbonate, Silica, Kaolin Clay, Mica, Talc

Organic

Monoazo, Diazo, Diarylide, Naphthol, Phthalo, Quinacridone, Perylene

Effect

Metallic, Pearl, Fluorescent

Coating Technology

Additives

Surface Active Agents

Wetting, Dispersing, Flow/Leveling, Emulsification, Foam Control

Rheological Additives

Newtonian, Shear Thinning, Shear Thickening, Thixotropy

Matting Agents

Silicas, Organic

Waxes

Fischer-Tropsch, Polyethylene, Polypropylene, Natural

Coating Technology

Additives

- Biocides
- Coalescents
- UVLA, HALS
- Photoinitiators
- Corrosion Inhibitors
- Driers, Anti-Skinning Agents
- Crosslinkers, Catalysts, Plasticizers

Coating Technology

Other Considerations

- End Use
  - Architectural, Industrial, Performance
- Substates
  - Metal, Wood, Concrete, Plastic, Gypsum
- Application
  - Brush, Roller, Spray, Dip, Curtain, Flow, Powder
- Curing
  - Air Dry, Bake, Radiation

Coating Technology

Other Considerations

- Surface Preparation
- Environment
- Packaging
- Testing Methods
  - Resistance, Gloss, Adhesion, Stain Blocking, Tensile, Modulus, Elongation, Flow and Leveling, Water Permeability, Hiding Power, Color Acceptance, Open Time, Drying, MVTR, Tg, MFFT, pH, VOC, etc.

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Coating Technology

Stain Resistance

Block/Print Resistance

Scrub Resistance

Crack Resistance

Chemical Resistance

Corrosion Resistance

Dirt Pickup Resistance

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School

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The Scientific Balance

Industry

The Scientific Balance

Empirical

Application

Experience

Industry

The Scientific Balance

Balance

The Scientific Balance

Chemistry
Physics
Mathematics
Theory

STEM

Mechanism
Concepts
Art

STEAM
R
T

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Surfactants

Any substance which will significantly reduce the surface tension of a liquid at a very low concentration.

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- Chemistry, Surface Tension, Wetting
- Micelles, Surface Pressure, Surface Transport
- Foam Control, Pigment Dispersion

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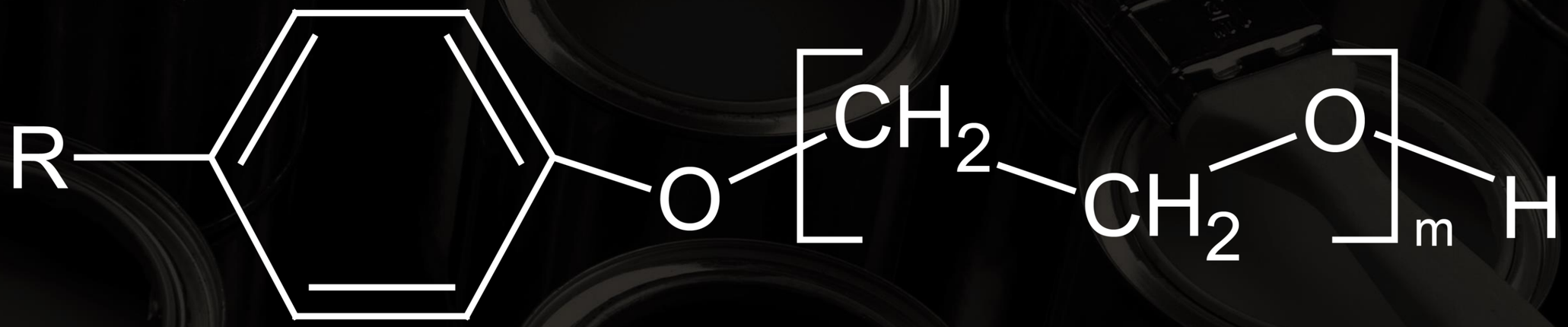
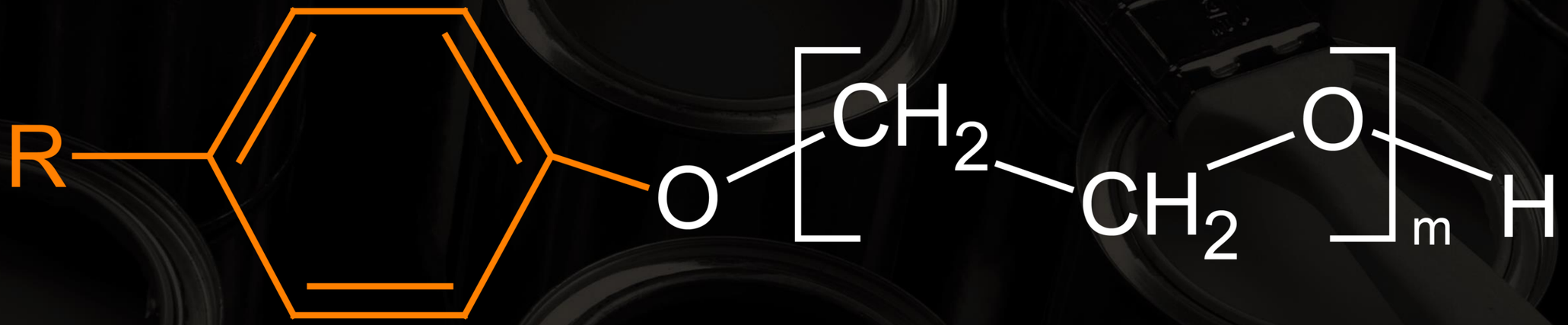
Chemistry



Chemistry



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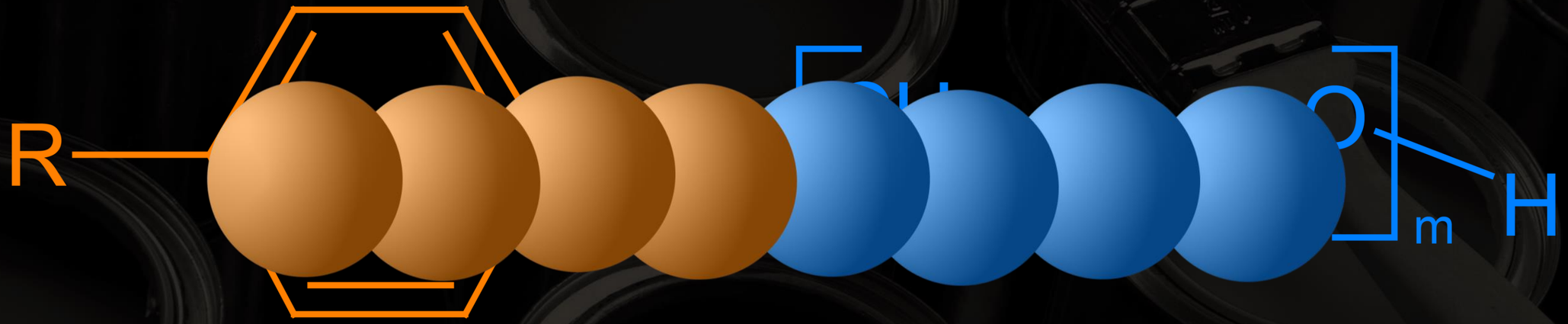

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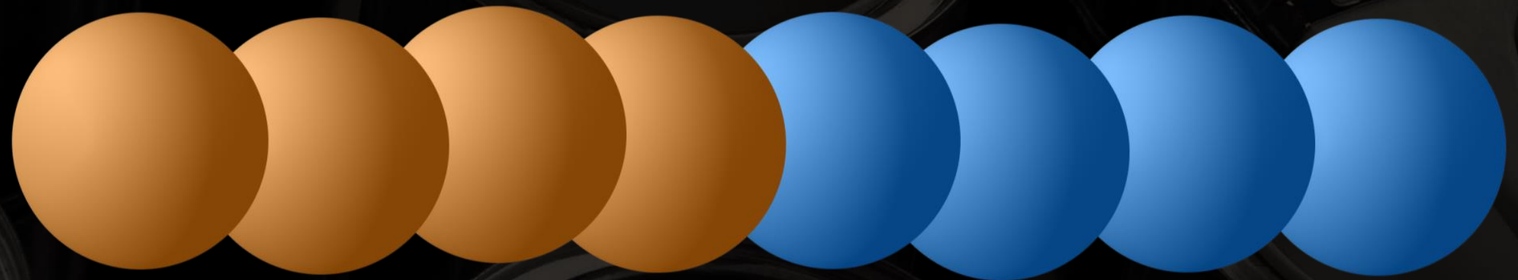

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Intermolecular Forces

- Van der Waals
  - London Dispersion
  - Induced-Dipole
  - Dipole-Dipole
    - Hydrogen Bonding
      - Charge Magnitude
      - Distance/Atomic Radius
      - Electronegativity Difference

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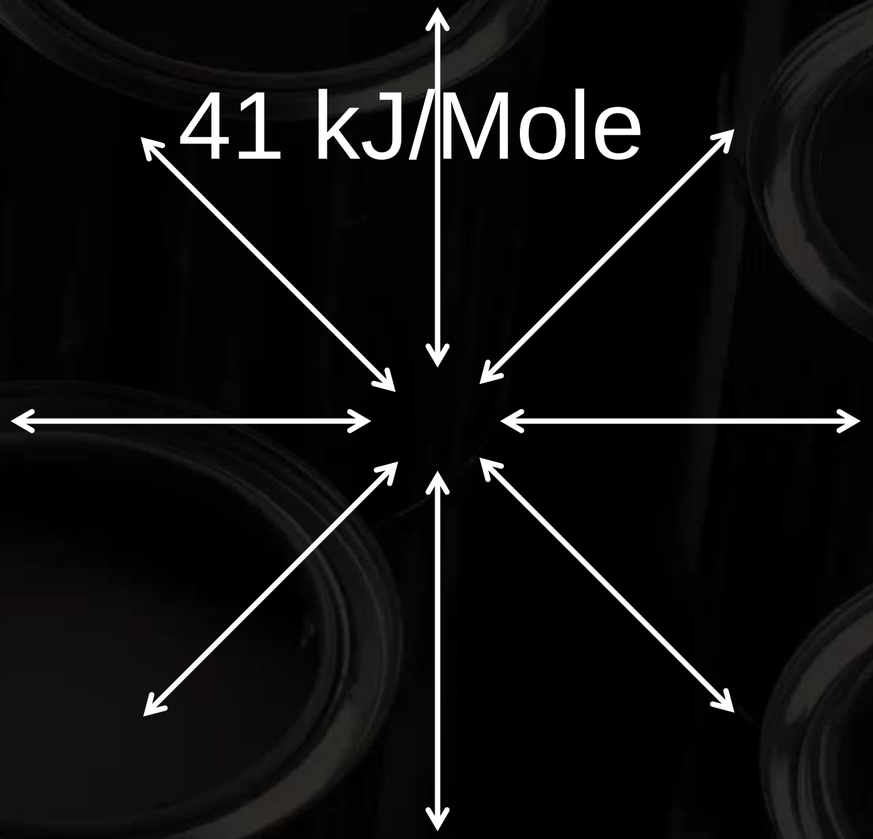
Intermolecular Forces



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Surface Tension

Surface Tension

Molecules at the surface possess a net attractive force into the bulk.

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Wetting

Contact Angles

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Micelles

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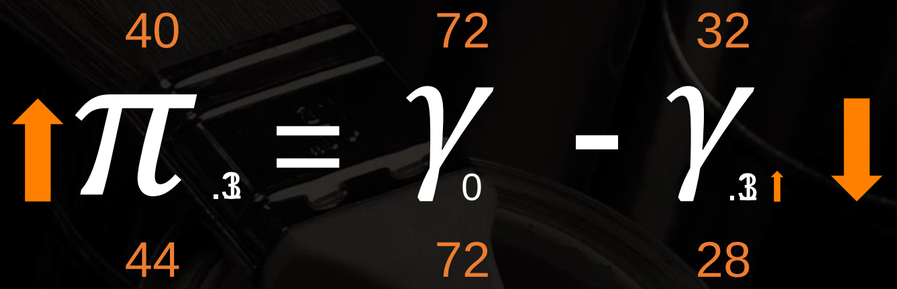

Surface Pressure

Surface Pressure

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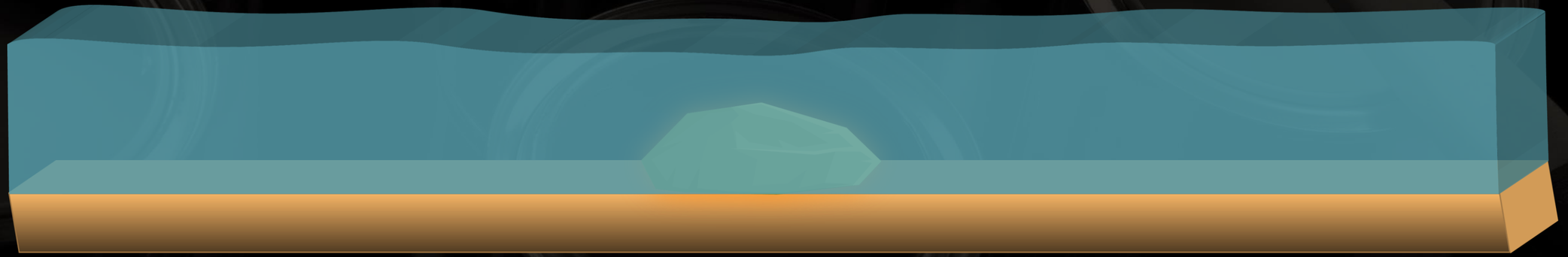
Surface Transport

Surface Transport

Surface Transport

Contaminant ⟶ Film Defects

- Oil Drop
- Dirt Particle
- Finger Print

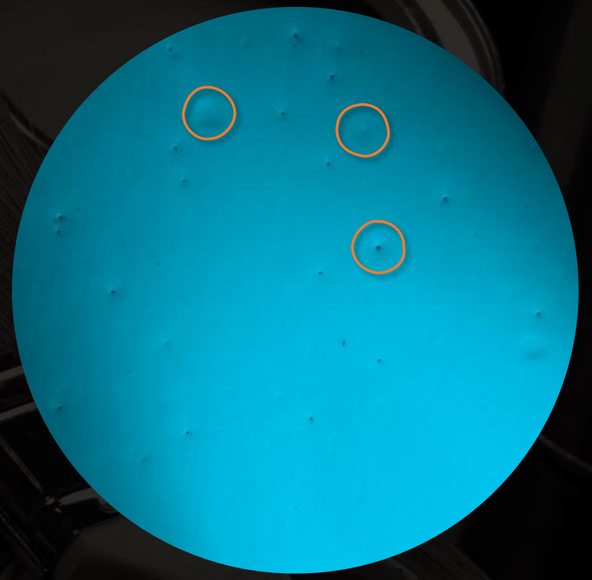


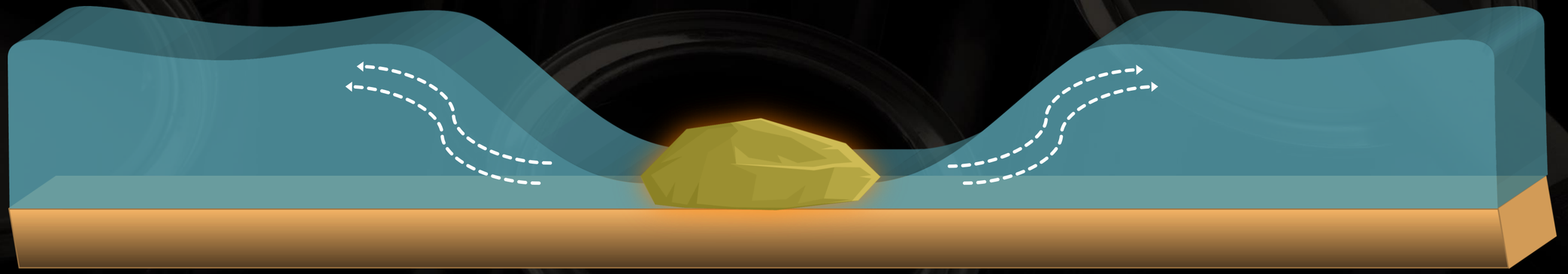
Surface Transport

Contaminant → Film Defects

- Oil Drop
- Dirt Particle
- Finger Print

- Craters
- Pinholes
- Fisheyes





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Foam Stabilization

Foam Stabilization

Foam Control

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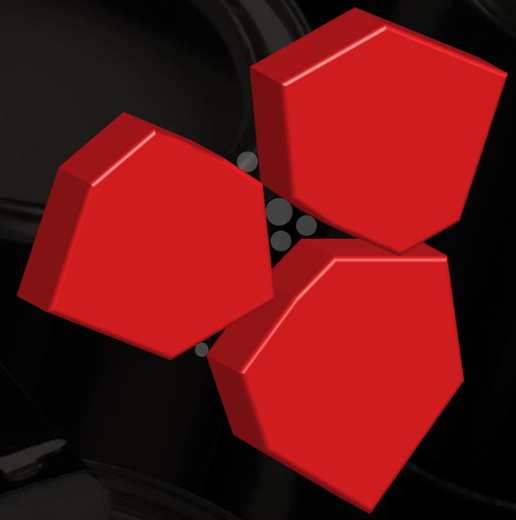
Pigment Dispersion

Wetting

Separation

Stabilization



Pigment Dispersion

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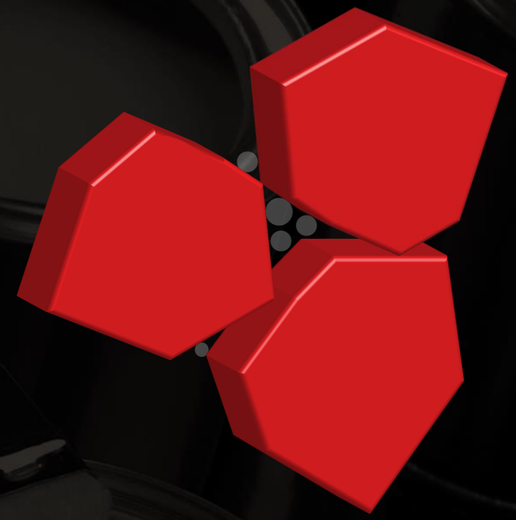

Young's Equation $\gamma_{LG} < \gamma_{SG}$

Washburn Equation $V = \frac{r}{21\,\eta} \cdot \gamma \cos\theta$

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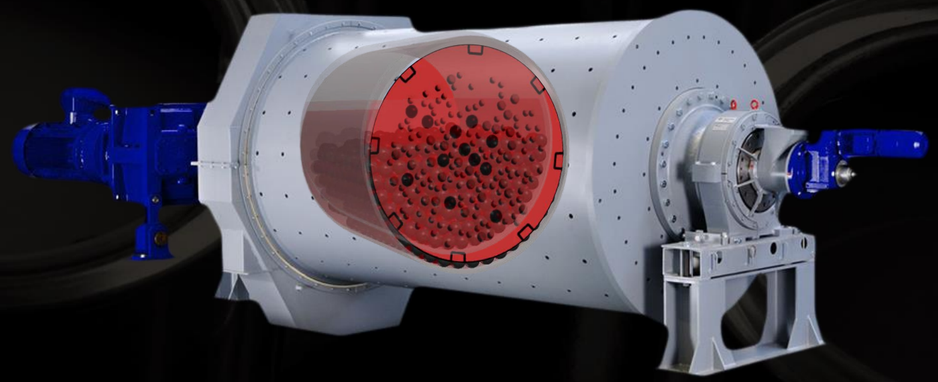

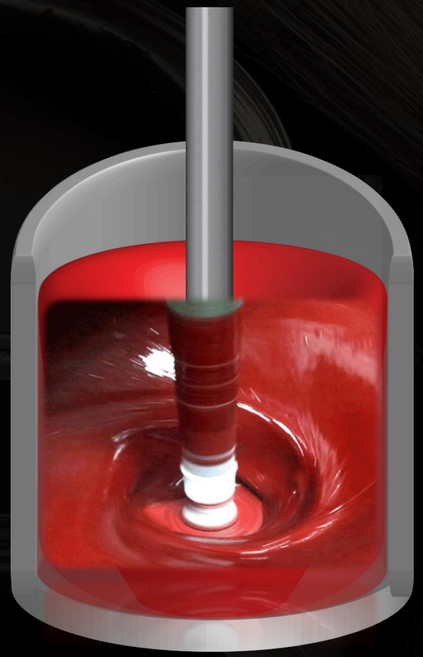

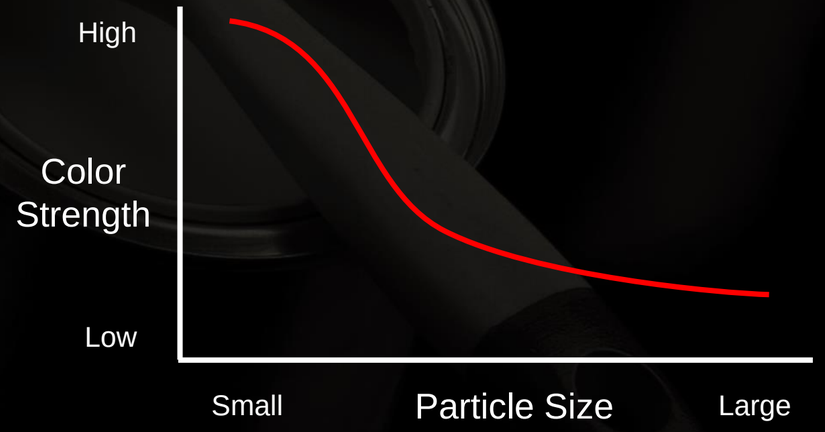

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Pigment Dispersion

Wetting

Separation

Stabilization

Pigment Dispersion

Wetting

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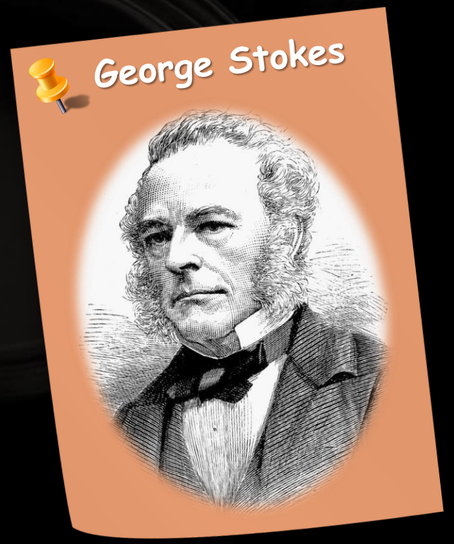
Stabilization

$$\uparrow v = \frac{(\rho_{particle} - \rho_{medium})\, g\, \uparrow r^2 \quad 2/9}{\eta}$$



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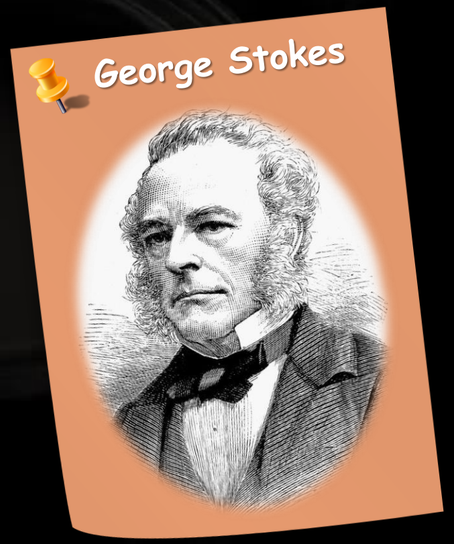

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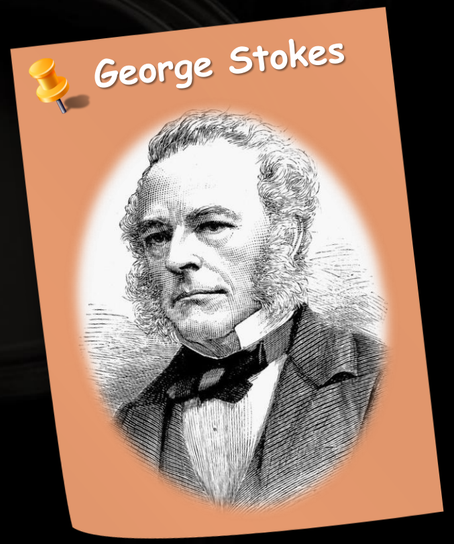

Pigment Dispersion

Wetting

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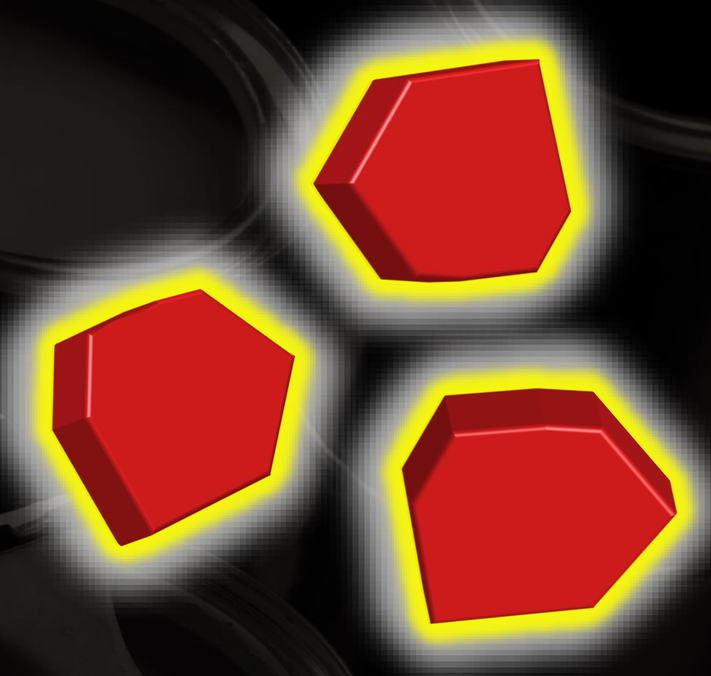

Pigment Dispersion

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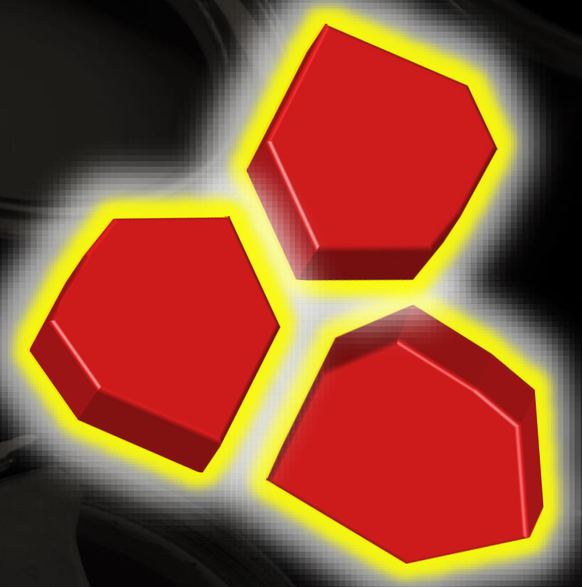


Pigment Dispersion

Wetting

Separation

Stabilization

Pigment Dispersion

Wetting

Separation

Stabilization

- Electric Double Layer

Pigment Dispersion

Wetting

Separation

Stabilization

- Electric Double Layer

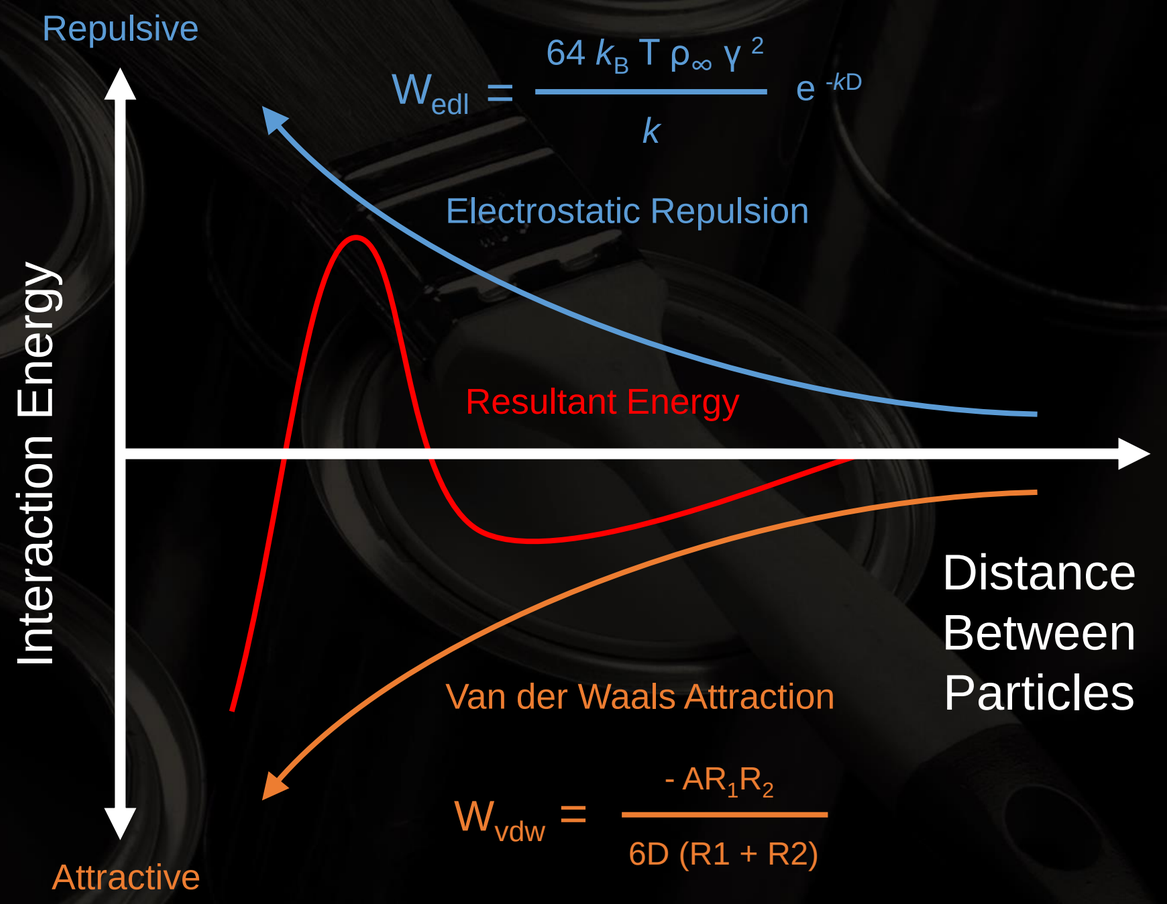
Pigment Dispersion

Wetting

Separation

Stabilization

- Electric Double Layer
- DLVO Theory



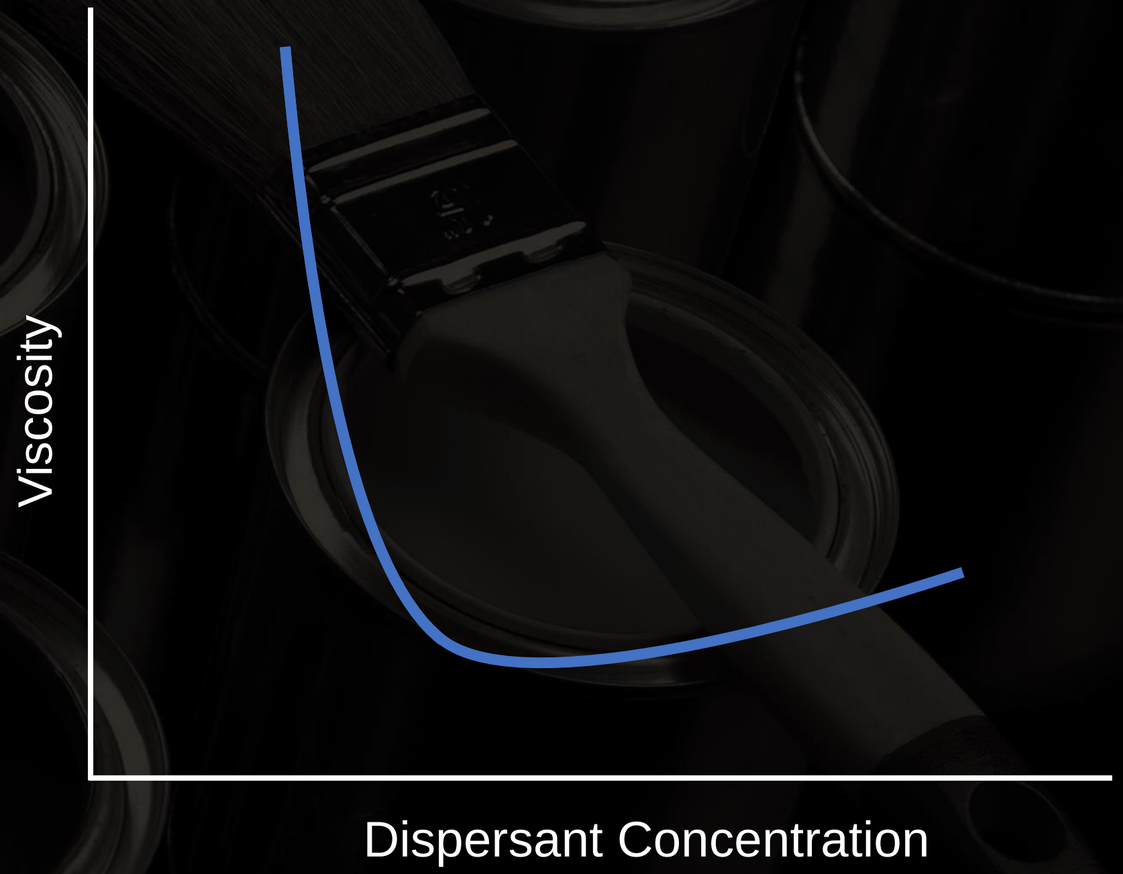
Pigment Dispersion

Wetting

Separation

Stabilization

- Electric Double Layer
- DLVO Theory
- Depletion Flocculation



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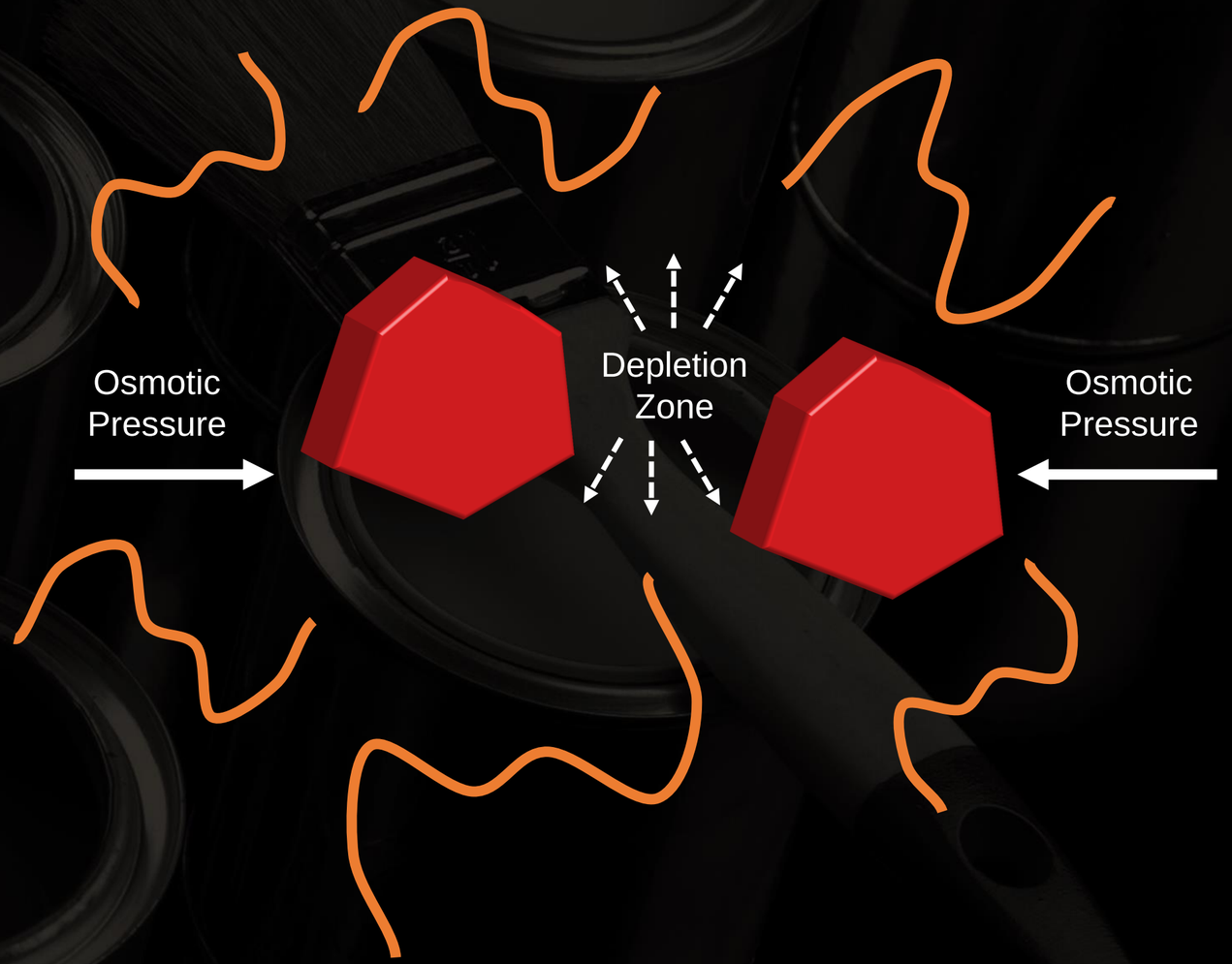

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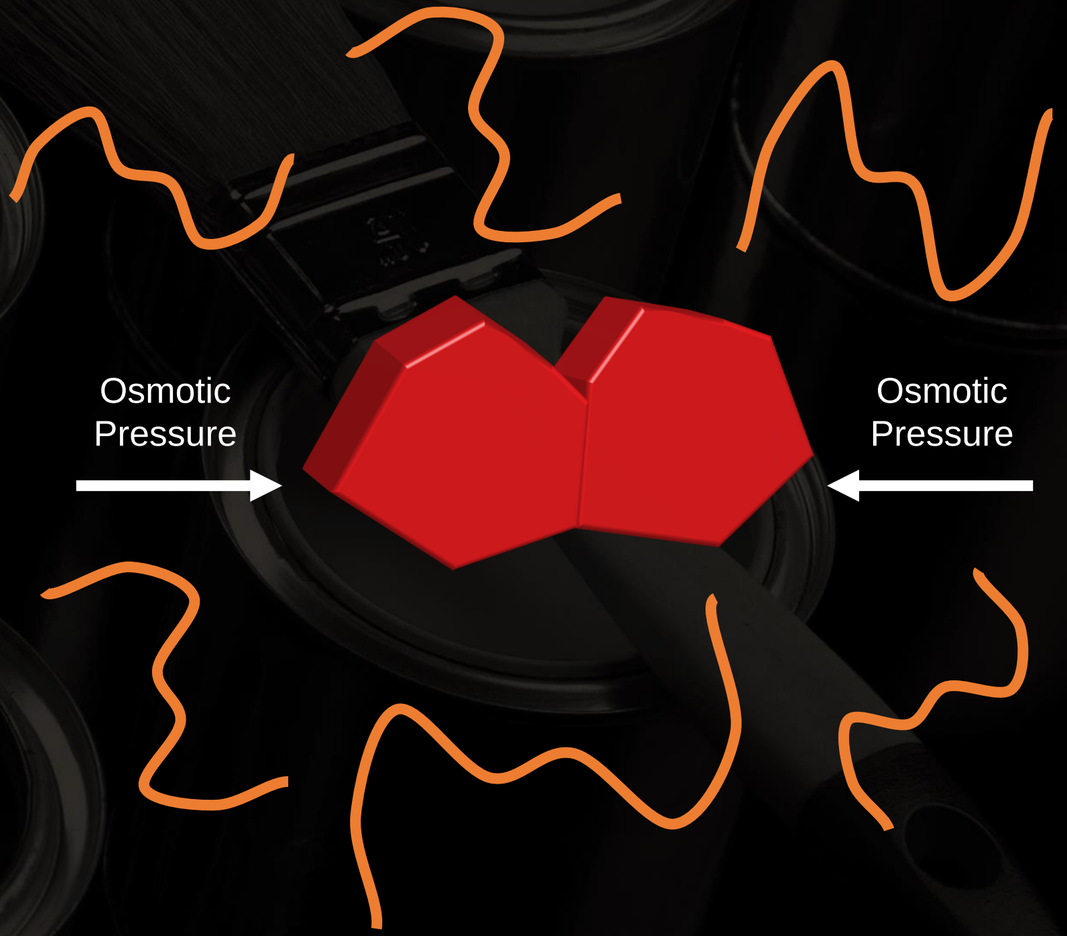

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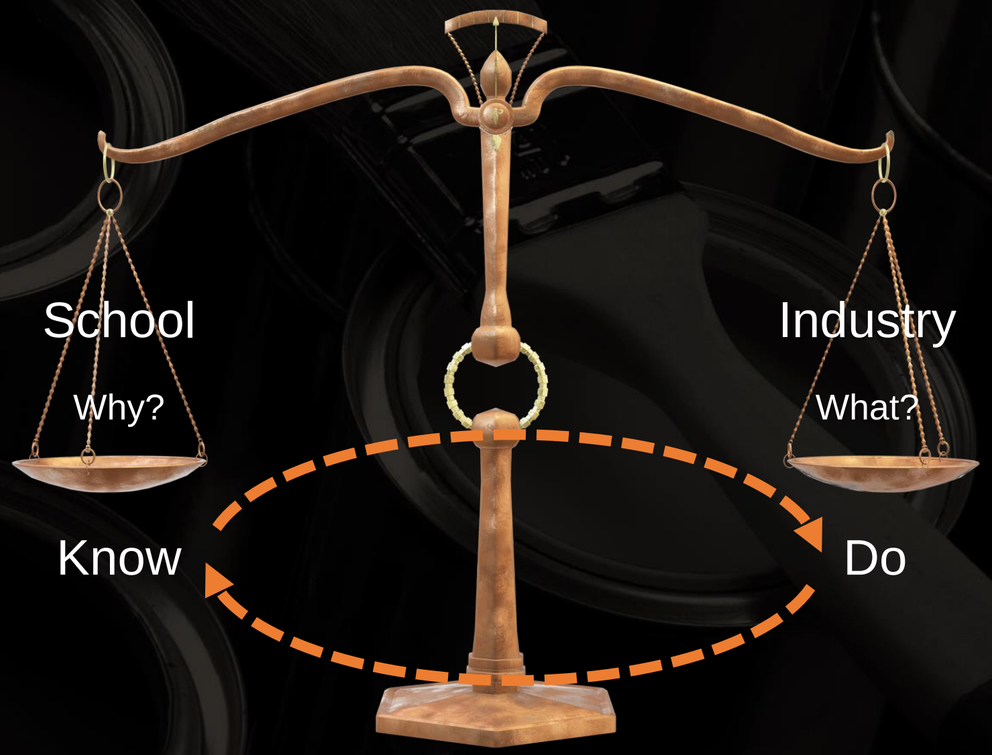
Those who Know . . .

but don’t Do . . .

Don’t Know!



Contact

914.273.0300

Sam.Morell@samMorell.com

linkedin.com/in/sammorell

youtube.com/c/SamMorell

samMorell.com

Contact

Sam Morell

LinkedIn

YouTube

samMorell.com