A Novel Multifunctional Buffer System for Enhanced Microbial Stability in Water-Based Formulations

2025 Coatings Trends & Technologies SUMMIT

9/4/2025

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Sustainable Chemistry

Who is NASOTIC?

- Founded by Ralph J. Woerheide who has 25 years experience in the coatings industry
- Goal: Make coatings more sustainable with innovative additives
- Currently four products in our portfolio
- Today: An in-can preservative as a buffer-based system

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Why a Novel In-Can Preservative System?

EU: Tough regulation for biocides

Goal: Not a new biocide, but an additive that stops microbial growth.

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First Steps in the Development Process

Experiments with biopolymers

- ✓ Very effective against bacteria and viruses
- ✗ Not stable in high pH value

New Approach:

pH value in waterborne systems is important for effective preservation!

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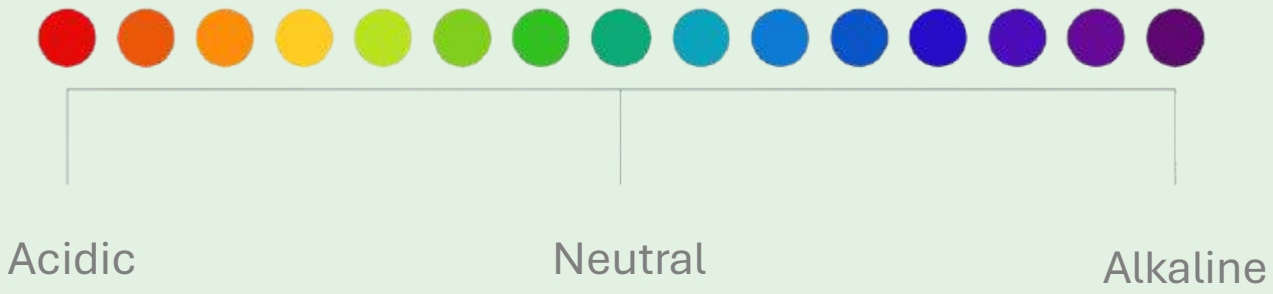
Focus on pH Management

- For preservative-free or low-preservative paints, antimicrobial protection is achieved by **increasing the pH value (10 – 11).**
- **Lower pH levels** improve conditions for microbial growth, triggering spore germination and subsequent microorganism proliferation.



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First Development Goal: Keep pH Constant!

- A **constant base** condition is an excellent way to prevent microbial proliferation.
- The task was to find a **stable, toxicologically and ecologically safe and not interacting buffer system.**

Norman Good:

- Buffer system originally used in microbiological applications to keep the pH value between 6 – 8.

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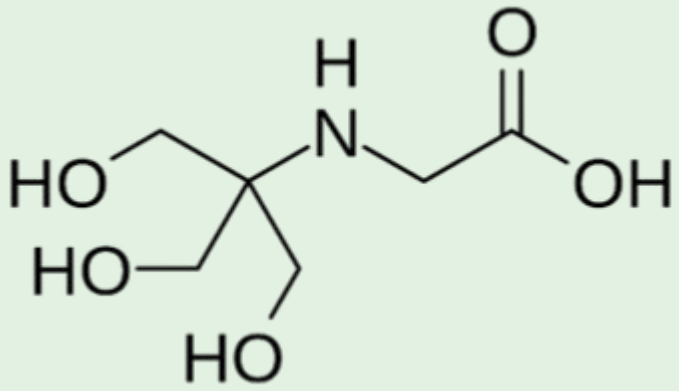
More Basic?

Tricin

- pK2 Value of 8.15
- High solubility, low toxicity, cost-effective production and chemical stability.



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Good Approach – But Enough?

Not good enough yet.

Extension: Reinforcement by Urea, additional zwitterion structures type amino acids → Membrane destabilization via electrostatic interaction.

- **But**: Stop microbial growth.

Idea:

Construction of a type of supramolecular structures through a network of hydrogen bonds

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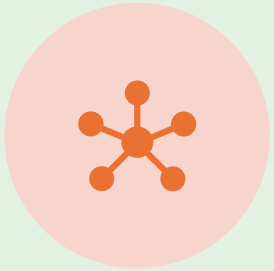
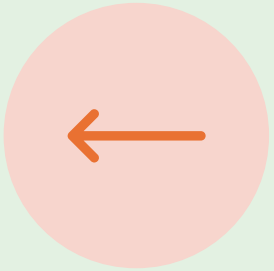
Supramolecular (Complex) Structures

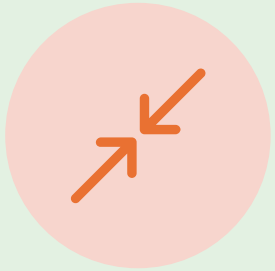


HYDROGEN BONDING NETWORK BETWEEN BUFFER COMPONENTS



SELF-ASSEMBLING STRUCTURES INHIBIT MICROBIAL ADHESION

SYNERGISTIC INTERACTION WITH EMULSIFIERS



IMPROVED LONG-TERM STABILITY AND COMPATIBILITY

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Breakthrough

Reactive dispersion:

- Modified Good's buffer system in highly dispersed form.
- Enhanced surface area and availability.

Mini emulsions:

- High activity and stability.
- Microencapsulation of active agents.
- Seamless integration into coatings and adhesives.

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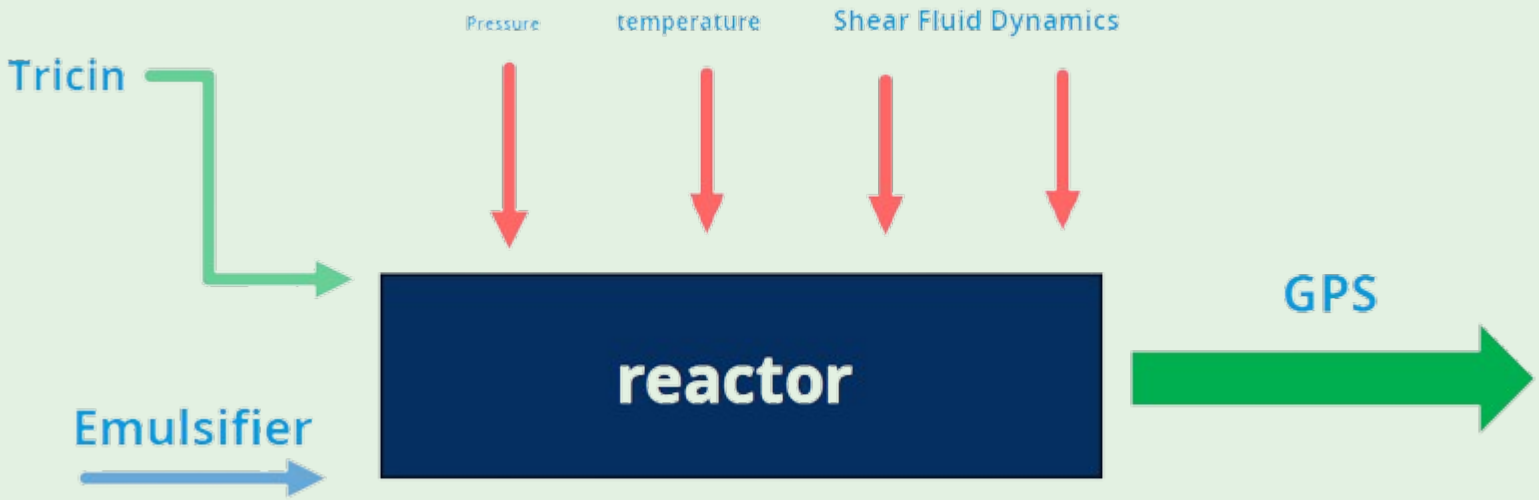
Mini Emulsions Make the Difference!



„Mini“ Emulsions:

- Encapsulation Technology
- Polymerizations

- ✓ Conti-Reactor
- ✓ Self-cleaning
- ✓ QC Lab automation
- ✓ Easy scalable
- ✓ Short setup time

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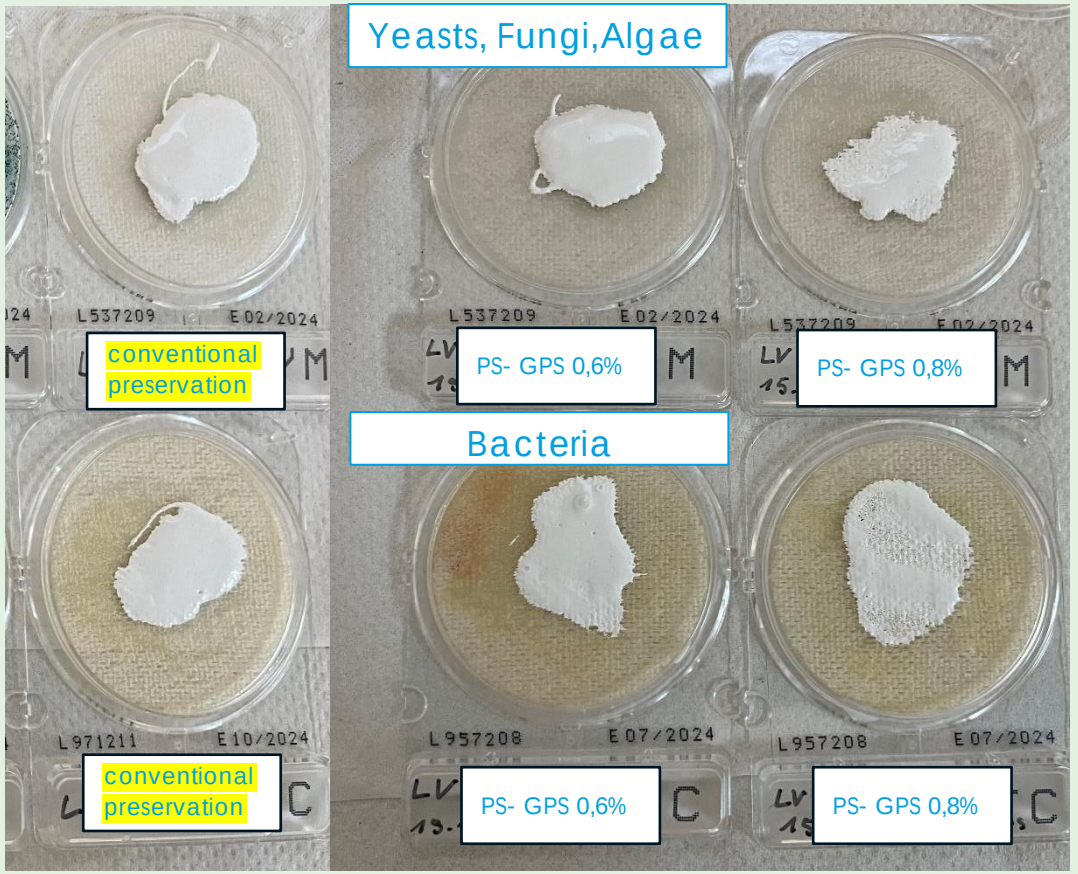
Results

Goal: In-Can Preservation

→GMP Hygiene control is necessary

→Novel system doesn't **kill** microorganisms.



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Go To Market: Now!

GPS launched in the EU

Regulations are currently under investigation (US)

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Thank you!

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