

Modern Cleaning Science

Why mother ferment is a Superior Approach to Cleaning

Surfactants, Micelles, and Why Their Performance Matters

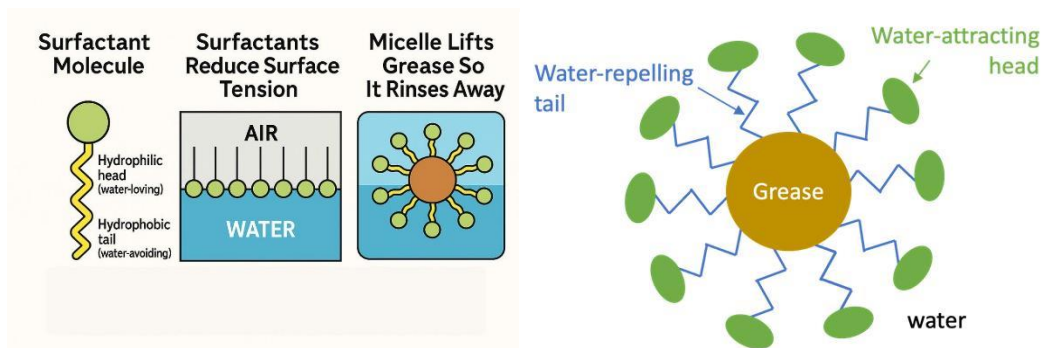
What Are Surfactants?

Surfactants (short for *surface-active agents*) are special molecules that make cleaning possible by helping water interact with oil, grease, and dirt.

A surfactant is like a two-sided connector:

- One end **loves water** (hydrophilic)
- One end **loves oil and grease** (hydrophobic)

Because of this, surfactants can **link water and oil together**, even though they normally don't mix.



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Why Surfactants Are Called “the Workhorse” of Cleaners

Surfactants earn the title “**workhorse**” because they perform the *essential, heavy-lifting tasks* that make cleaning possible. Without them, most cleaners would do very little beyond moving water around.

1) They Do the Actual Cleaning Work

Water alone cannot remove grease effectively—it beads up and slides off oils. Surfactants change that by:

- Breaking apart grease
- Surrounding oil with micelles
- Lifting dirt off surfaces
- Keeping it suspended so it can be rinsed away

In other words, **they are the ingredient that physically removes contamination**, not just spreads liquid.

2) They Enable Everything Else to Work

Surfactants don’t just clean—they **unlock the performance** of the entire formula:

- Help water spread evenly across surfaces
- Allow other ingredients (enzymes, solvents, builders) to reach dirt
- Improve penetration into pores, fibers, and crevices

Without surfactants, even advanced ingredients struggle to reach their target.

3) They Operate at the Molecular Level

Surfactants work where you cannot see:

- At the interface between oil and water
- On microscopic films of grease
- Inside tiny surface irregularities

They act continuously during cleaning—breaking, lifting, and dispersing contaminants at a molecular scale.

4) They Work Throughout the Entire Cleaning Process

From start to finish, surfactants are active:

1. **Initial contact** → reduce surface tension so liquid spreads
2. **Activation (CMC)** → form micelles that trap oils

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3. **During agitation** → keep dirt suspended
4. **Rinse phase** → prevent redeposition

They don't just start the process—they carry it all the way through.

5) They Deliver Efficiency and Speed

Because surfactants:

- Activate at specific concentrations
- Organize quickly into micelles
- Continuously capture and hold dirt

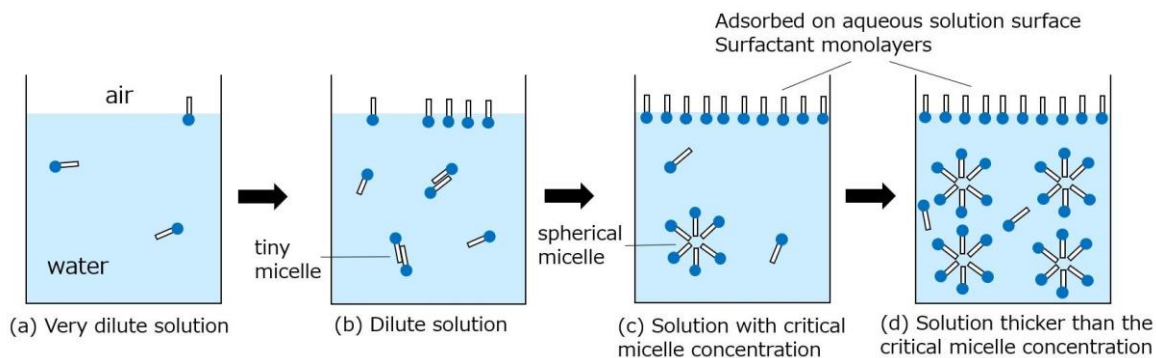
They determine:

- How fast cleaning begins
- How thoroughly surfaces are cleaned
- How much product is needed

Simple Way to Think About It

If a cleaner were a team, surfactants would be the ones doing the heavy lifting—grabbing, breaking, and carrying away the dirt.

6) Critical Micelle Concentration (CMC) — The Activation Point



As surfactant is added to water:

- At low concentrations → molecules spread across surfaces and begin reducing surface tension
- At a specific threshold → they begin forming **micelles** (tiny spherical clusters that trap oils)

This threshold is called the **Critical Micelle Concentration (CMC)**.

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Key Understanding

- **Below CMC:** Cleaning power is still developing
- **At/above CMC:** Cleaning becomes fully effective

Scientific Basis

- CMC is the concentration where micelles begin forming
- Beyond this point, added surfactant forms more micelles rather than further lowering surface tension (Source: Critical Micelle Concentration)

Why Speed Matters - CMC is not just a value—it directly impacts how fast cleaning begins:

- Faster molecular organization → faster grease breakdown
- Faster adsorption → immediate surface action
- In real-world use (spraying, wiping), **speed defines perceived performance**

Critical Micelle Concentration Efficiency is how fast they can form and start cleaning.

System	CMC
SLS	~0.23%
Plant-based	~0.02–0.1%
Mother ferment's Biosurfactant blend	0.00524%

Clean Interpretation

mother ferment compared to SLS:

- **~44× more efficient activation**
- Cleaning begins at **~98% lower concentration**

mother ferment compared to plant-based surfactants:

- **~4× to 19× more efficient**
- Cleaning begins at **~74–95% lower concentration**

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What “Faster” Really Means in Practice

A lower CMC translates to:

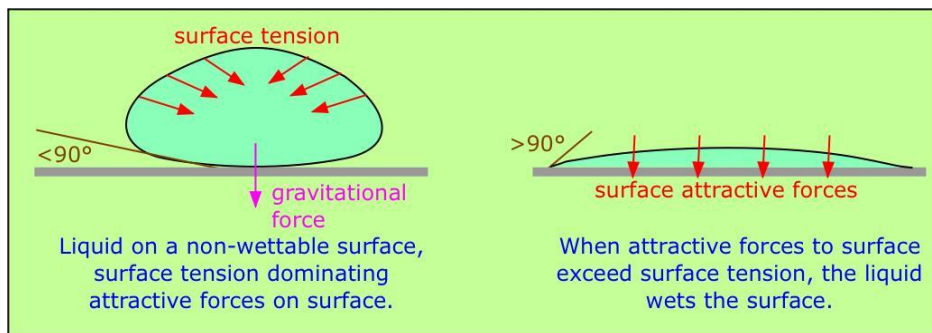
- Immediate surface activation upon contact
- Faster spreading and penetration
- Reduced dwell time needed
- More cleaning per drop

Final Insight

A system that activates at dramatically lower concentration doesn't just use less—it **begins working sooner, spreads faster, and cleans more efficiently from the very first contact.**

Sources: SLS and Plant Based Surfactants https://surfactant.alfa-chemistry.com/critical-micelle-concentration-cmc-lookup-table.html?utm_source Bioferment Technology – Augustine Scientific Report, March 12, 2022.

7) Post-Critical Micelle Concentration Plateau Surface Tension — Why It Matters



As concentration increases:

- Surface tension drops rapidly
- Then reaches a **plateau** (a stable minimum level)

What This Means

At the plateau:

- Surfaces are fully coated with surfactant
- Water spreads easily across surfaces
- Oils are efficiently lifted and emulsified

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Key Insight – The lower the plateau surface tension, the better the cleaning performance

Surface Tension Is Measured in mN/m

Surface tension is a **force per unit length**, measured in:

- millinewtons per meter (mN/m)

This unit describes how strongly a liquid surface resists spreading.

Example

- Pure water ≈ 72 mN/m (high tension, forms droplets)
- Effective surfactants reduce this dramatically

Meaning in Practice

- Lower mN/m $\rightarrow$ better spreading
- Better spreading $\rightarrow$ more surface coverage
- More coverage $\rightarrow$ more effective cleaning

Surface Tension Industry Benchmarks

CMC (Typical Ranges) source: <https://www.kruss-scientific.com/en/know-how/glossary/critical-micelle-concentration-cmc-and-surfactant-concentration> Bioferment Technology – Augustine Scientific Report, March 12, 2022.

Surface Tension at CMC

- SLS: $\sim 33\text{--}40$ mN/m
- Plant-based systems: $\sim 30\text{--}40$ mN/m
- mother ferment biosurfactant blend: ~ 23.13 mN/m

Result:

- 30–42% lower than SLS
- 8–34% lower than plant-based systems

What This Means for Cleaning Efficiency

1) Faster Surface Coverage

Lower surface tension allows liquid to:

- Spread instantly instead of beading

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- Cover more area with less product

Result: quicker cleaning action from first contact

2) Deeper Penetration

Lower tension enables liquid to:

- Enter microscopic pores and crevices
- Reach trapped grease and residues

Result: more thorough cleaning, not just surface-level

3) Better Grease Breakdown

Improved wetting allows:

- Stronger interaction between surfactant and oil
- Faster micelle formation around contaminants

Result: grease lifts more easily and completely

4) Less Product Needed

Because the liquid spreads and works more efficiently:

- Smaller amounts achieve full coverage
- Reduced need for reapplication

Result: higher efficiency per use

5) Reduced Residue

Better dispersion and rinsing leads to:

- Less leftover film
- Cleaner final surface

Final Insight

A reduction of 20–40% in surface tension is not incremental—it represents a step-change in how effectively a cleaner can reach, lift, and remove contamination.

- Greater efficiency
- Reduced chemical impact

This represents the direction of **next-generation, high-performance, non-toxic cleaning technologies**.