New-to-Market, Sustainable Biobased Internal Olefin Sulfonate That Delivers Performance in Home- and Fabric-care Formulations

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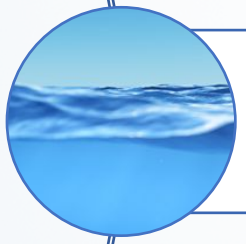
PILOT® CHEMICAL COMPANY

KAO

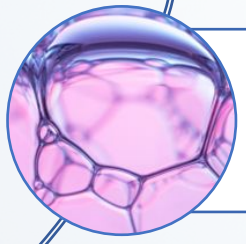
Surfactants of the Future

Must meet sustainability goals without compromising performance

Biobased: Readily available without competing with food



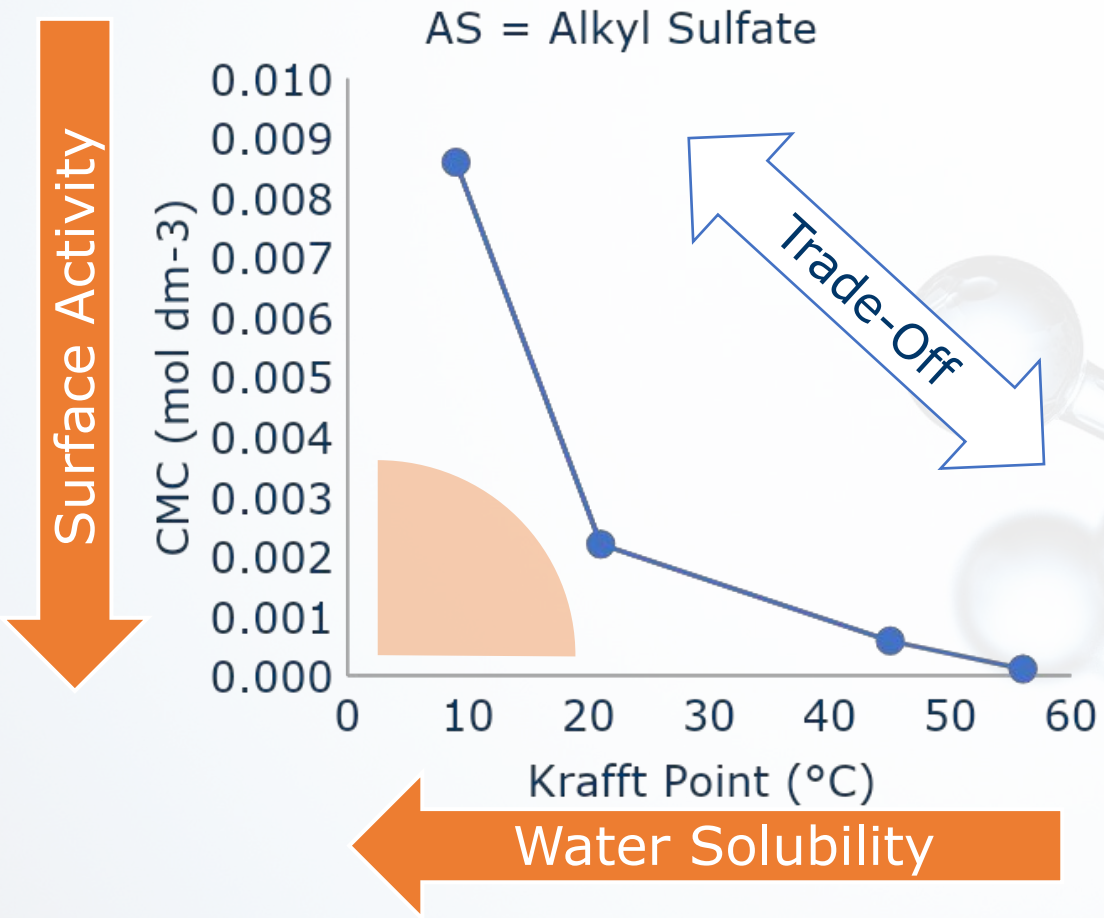
Water Soluble: For washing in cold water



Surface Activity: Maximum performance with minimum quantity

What Makes a Good Surfactant?

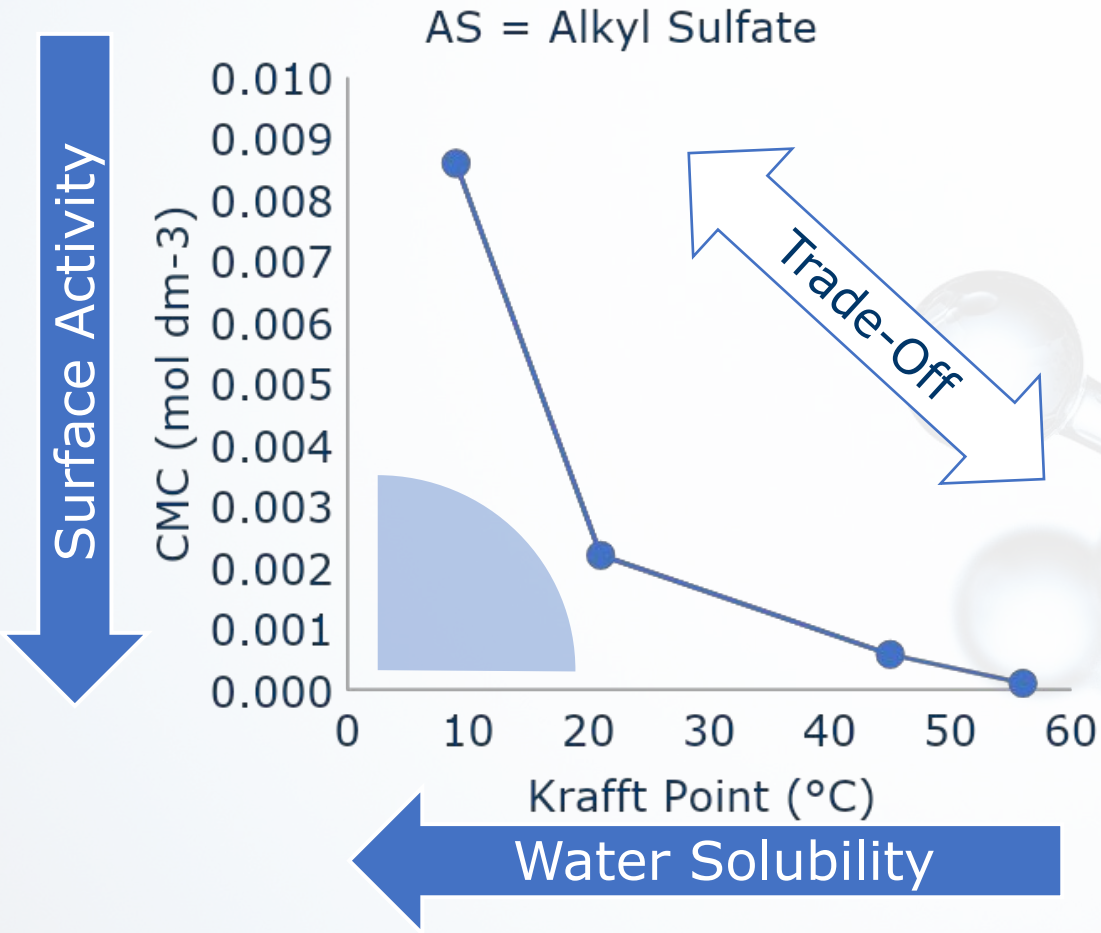
Good cleaning comes from a low Krafft point and low CMC*, and laurics (C12-14) can yield suitable cleaners.

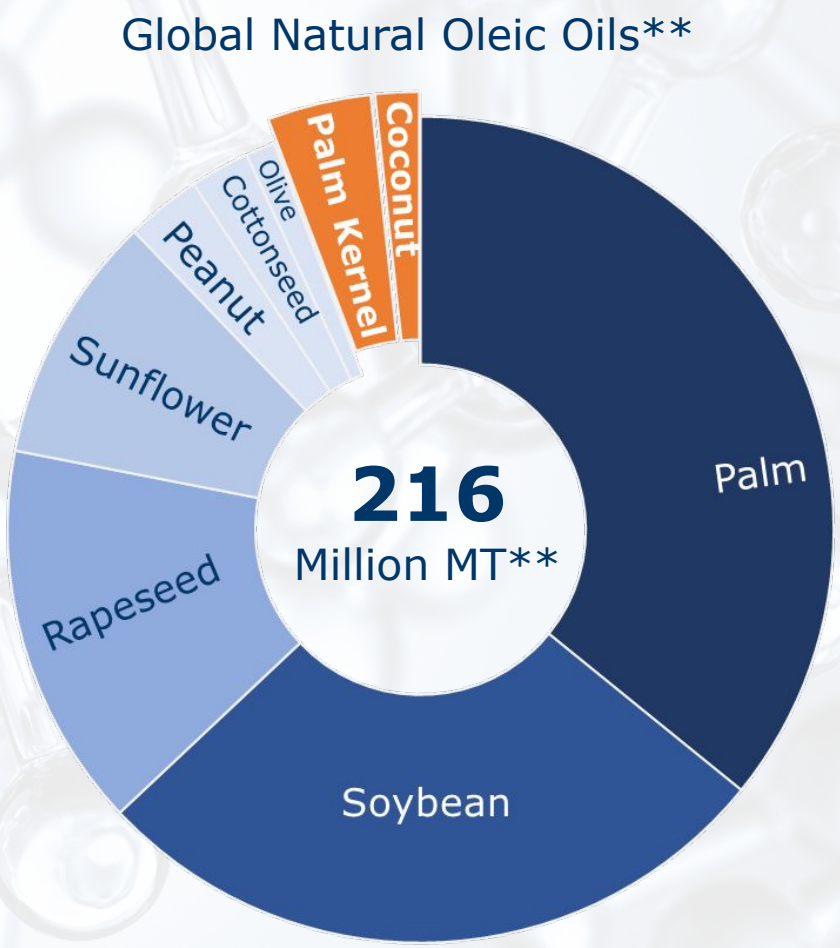


*CMC = Critical Micelle Concentration

What Makes a Good Surfactant?

Good cleaning comes from a low Krafft point and low CMC*. Laurics (C12-14) can yield suitable cleaners, ***but natural laurics are limited.***



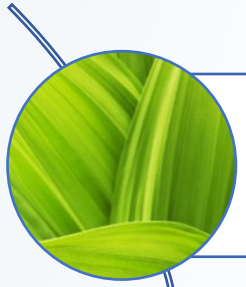


*CMC = Critical Micelle Concentration

** Source: Oilseeds 2023: "World Production, Markets, and Trade Report"

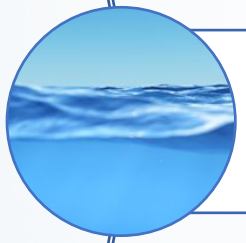
Surfactants Today

Only partially meet the needs for surfactants of the future



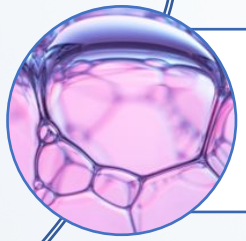
Biobased: Readily available without competing with food

Long-term limitations with natural laurics



Water Soluble: For washing in cold water

What's readily available (C16-18) has low solubility

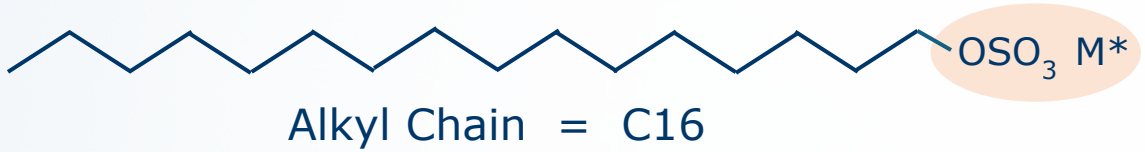


Surface Activity: Maximum performance with minimum quantity

Fermentation has gaps in scale and cost

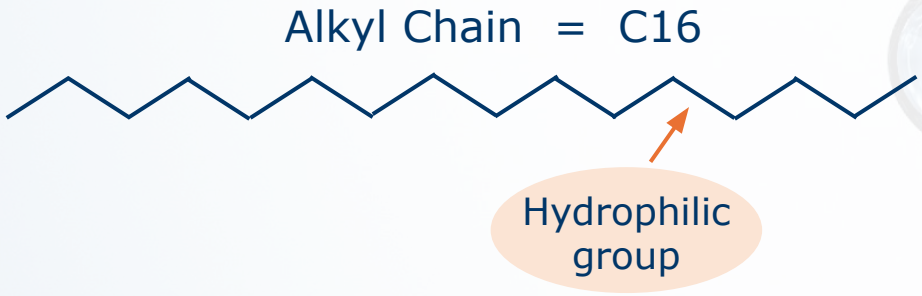
Kao Developed a Breakthrough

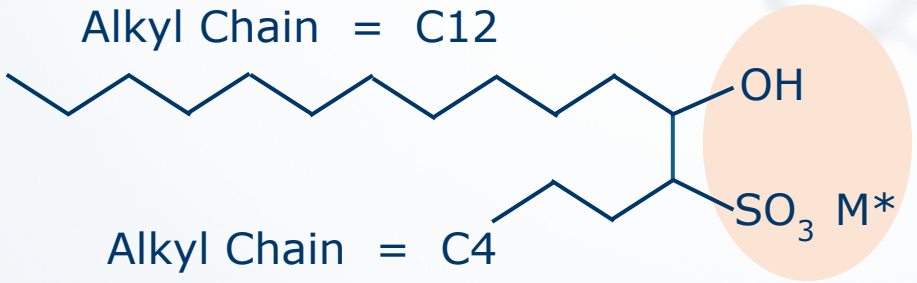
Surfactant technology utilizing the abundant waxy side stream can solve all three future surfactant goals

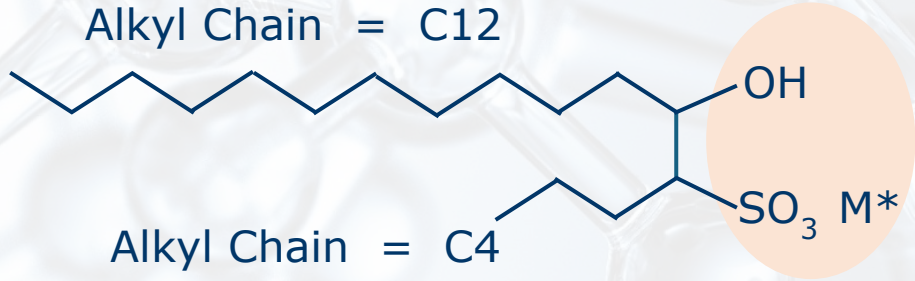


- ☺ Biobased
- ☹ Water Soluble
- ☺ Surface Activity

What if we moved the hydrophile along the alkyl chain?







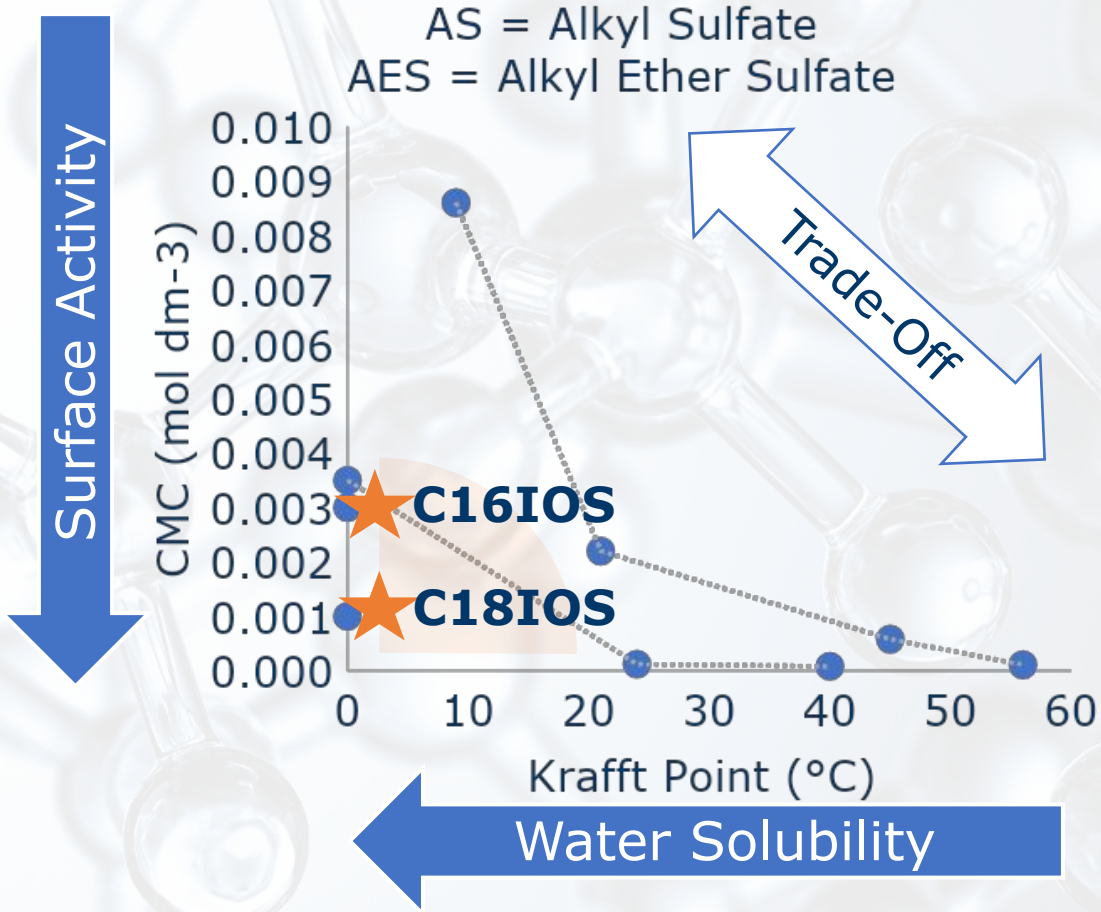
- ☺ Biobased
- ☺ Water Soluble
- ☺ Surface Activity

*M is Na or K

Bio-IOS vs. Traditional Surfactants

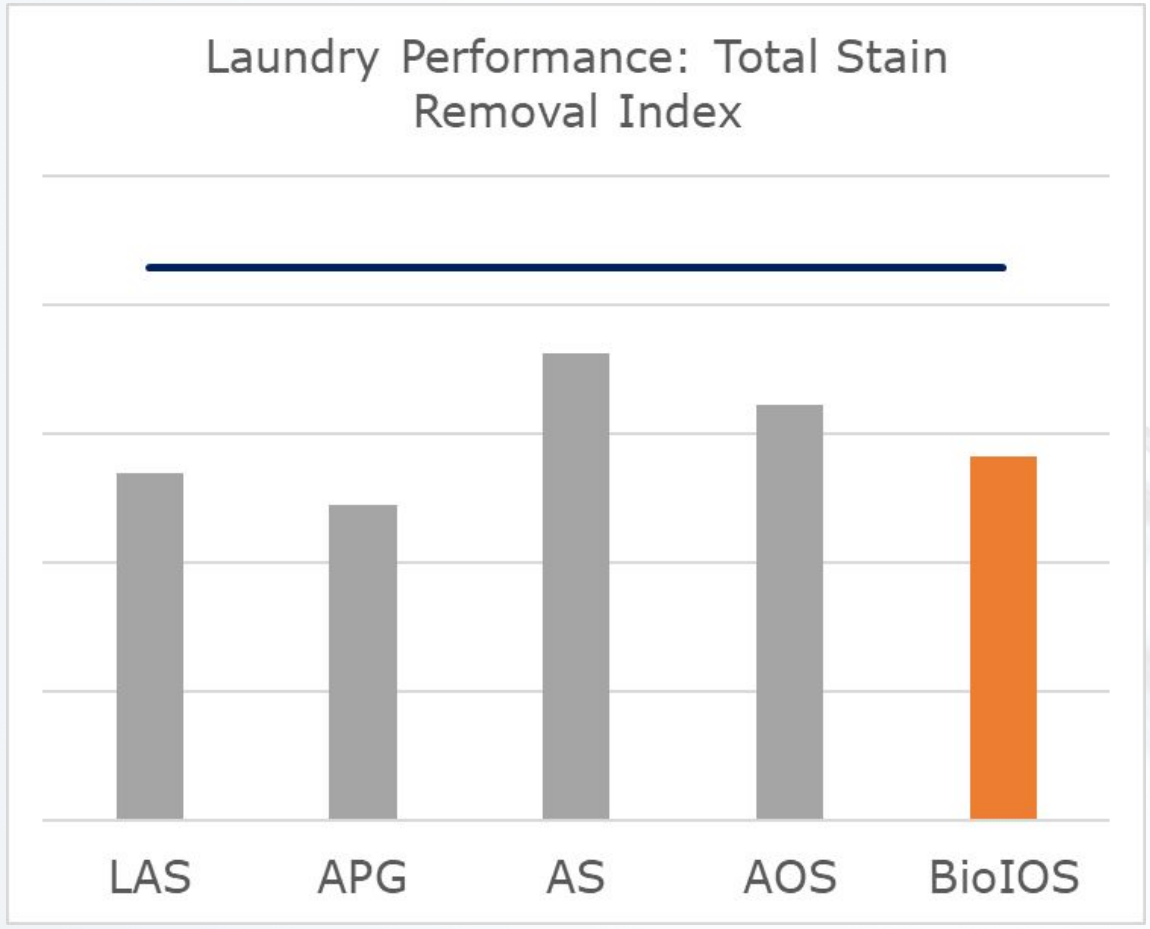
C16IOS and C18IOS have higher surface activity and superior water solubility

- Bio-IOS superior Krafft Point & CMC
- Stable, abundant feedstock
- Less likely to compete for food
- 100% Biobased
- 1,4-Dioxane Free
- Sulfate Free
- Mild surfactant
- Commercial scale production
- Affordable performance



Bio-IOS Laundry Performance*

Bio-IOS as a primary surfactant delivers competitive performance with traditional surfactants



Testing Formulation

Component	Wt% Actives
Water	To 100%
Surfactant	15.0%
Hydrotrope	0.4%
Builder	2.0%
Chelating Agent	0.7%
Defoamer	1.0%
Citric acid / Caustic	QS (pH = 8.0 – 8.3)

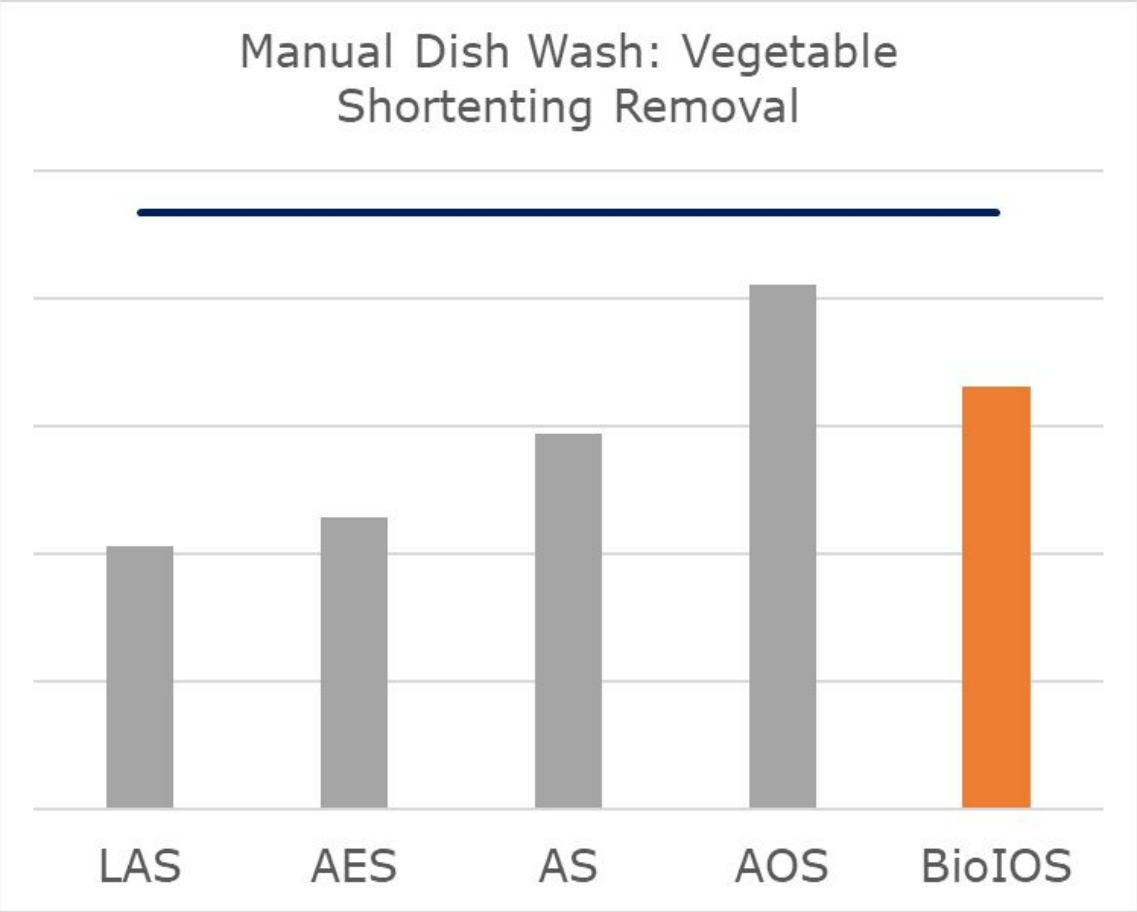
Stains

Coco	Coffee	Grass	Motor Oil
Clay	BMI	Cranberry	Red Wine
Spaghetti	Beef Gravy		

* Test Method = ASTM D4265

Bio-IOS Manual Dish Performance

Bio-IOS delivers better performance at removing grease than most traditional surfactants



Test Method (Triplicate)

- Pre-weighed 250mL beaker with 3g shortening applied and solidified on bottom
- 0.12% active aqueous solution of test formulation at 46C is then added to 250mL line on beaker
- After 15 minutes, beaker is emptied, gently rinsed twice at room temp
- After drying overnight, beaker is weighed to determine amount of grease removal

Testing Formulation

Component	Wt% Actives
Water	To 100%
Surfactant	10.0%
Builder	2.0%
Chelating Agent	0.7%
Citric acid/ Caustic	QS (pH = 10.9 – 11.2)

Kao & Pilot Chemical

We are partnering to bring this breakthrough technology to market in North America

- Kao has invested in Internal Olefin (IO) production
- Pilot Chemical is partnering with Kao for North America
- Together we will bring Bio-IOS to the North American Market
- Anticipated launch in 2026

Thank You!

Pilot Bio-IOS Website

Kao Bio-IOS Website

For more information:

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