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Agricultural Silicone Penetrant Silfluo LA-11

Polyether-Modified Trisiloxane Agricultural Surfactant

Description:

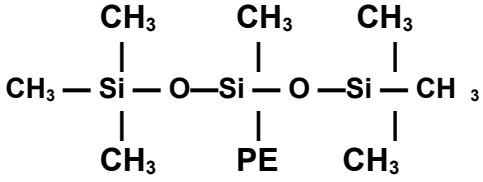
Silfluo LA-11 is a 100% active nonionic polyether-modified trisiloxane surfactant (CAS 27306-78-1) based on a methoxy-terminated polyalkyleneoxide-modified heptamethyltrisiloxane structure, for use as an agricultural spray adjuvant.

At 0.1 wt% aqueous concentration, LA-11 reduces surface tension to below 21.0 mN/m. Conventional hydrocarbon surfactants typically reduce surface tension to 28–32 mN/m at equivalent concentration; the trisiloxane structure achieves values below 21 mN/m, the threshold required for stomatal infiltration on hydrophobic leaf surfaces.

Compared to hydroxyl-terminated trisiloxane ethoxylates (e.g., LA-10), the methoxy/methyl-capped polyether end group of LA-11 produces a lower foam profile under tank agitation conditions, reducing foam-related interruptions during spray preparation.

Performance is equivalent to Momentive Silwet L-77.

Typical Technical Properties:

Silfluo Code:	LA-11
Chemical Name: Synonyms:	Polyether-Modified Trisiloxane Trisiloxane Ethoxylate (TSE), Superspreading Surfactant, Agricultural Silicone Adjuvant; Methoxy-terminated /Methyl-capped polyether-modified trisiloxane
Main Content:	Polyalkyleneoxide Modified Heptamethyltrisiloxane
CAS NO.:	27306-78-1
Appearance:	Clear, colorless to pale yellow liquid
Active Content (%):	100
Viscosity (25°C, mPa·s):	10 - 30
Refractive Index (at 25°C):	1.440 - 1.450
Surface Tension (0.1% aq., 25°C, mN/m):	< 21.0 mN/m
Cloud Point (1.0 wt% aq., °C):	< 10
Ionic Nature:	Nonionic
Chemical Structure:	 PE: Polyether

Mechanism of Action

The trisiloxane backbone adopts a "T-shaped" molecular geometry at the air-water interface, enabling

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surface tension reduction to below 21 mN/m at 0.1 wt%. At this surface tension level, the contact angle of spray droplets on wax-coated leaf surfaces drops below the threshold for stomatal entry, expanding the wetted area per droplet relative to hydrocarbon surfactant systems.

Reduced surface tension below 21 mN/m allows aqueous droplets to enter open stomata (typical pore width 3 – 15 μm) by capillary penetration, bypassing the cuticular wax barrier and placing water-soluble active ingredients into the sub-stomatal cavity for direct uptake into plant vascular tissue. This pathway is relevant for systemic herbicides, plant growth regulators, and foliar-applied micronutrients where cuticular penetration rate limits efficacy.

Following stomatal entry, active ingredients contact the substomatal chamber and are taken up via the apoplastic or symplastic pathway depending on the physicochemical properties of the active.

Rainfastness is achieved within 15 – 30 minutes of application under field conditions, as stomatal absorption occurs before rainfall removes the spray deposit from the leaf surface.

Applications and Recommended Use Rates

LA-11 is active in the concentration range 0.015 – 0.15 wt% of the spray tank volume (e.g., 5 g per 20 kg of spray solution). Initiate testing at 0.1% and reduce to the minimum effective concentration for the specific active ingredient, crop, and application method. Concentrations above 0.15% do not proportionally improve spreading and may cause phytotoxicity on sensitive crops; verify on target crop at recommended rates before commercial application.

Agrochemical Class	Recommended Use Rate (wt% of spray volume)
Plant Growth Regulators	0.025%–0.05%
Herbicides	0.025%–0.15%
Insecticides	0.025%–0.1%
Fungicides	0.015%–0.05%
Fertilizers and Trace Elements	0.015%–0.1%

Spray Tank Mixing Sequence:

1. Fill the mixing tank to 80% capacity with water.
2. Add agrochemicals and agitate until fully dissolved.
3. Add the calculated volume of LA-11.
4. Add remaining water to reach 100% volume and agitate gently to limit foam generation.

Do not add LA-11 directly to concentrated agrochemical before dilution — premixing at high active ingredient concentration may cause incompatibility or precipitation.

Application Parameters

pH window: maintain spray mixture at pH 6.0 – 8.0. Apply within 24 hours of preparation; hydrolysis of the trisiloxane Si – O – Si bonds occurs at pH ⩽ 5.0 or ⩾ 9.0, generating heptamethyltrisiloxanol

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and the polyether fragment — both surface-inactive — reducing adjuvant efficacy.

Temperature: apply at ambient temperatures between 10°C and 35°C. At temperatures below 10°C, stomata may be closed, reducing the stomatal infiltration pathway regardless of surface tension.

Nozzle selection: flat-fan or hollow-cone nozzles with small aperture (< 0.3 mm tip) are recommended to produce fine droplets (VMD 150 – 250 μm) that improve canopy penetration and droplet coverage density per unit leaf area.

Spray water volume: total spray water volume can typically be reduced by up to 30% compared to standard applications at equivalent active ingredient dose per hectare. Verify reduction rates via field trial before commercial adoption.

IN-CAN FORMULATION CRITERIA

LA-11 is compatible as a component in concentrated agrochemical formulations at 0.5 – 8.0 wt% of the total formulation weight, provided the system is buffered to pH 6.5 – 7.5. Hydrolysis rate increases rapidly at pH ⩽ 5.0 or ⩾ 9.0; formulations outside this range will show loss of surface activity on accelerated stability testing. Trisiloxane surfactants can interact with certain emulsifiers, co-solvents, and ionic active ingredients. Compatibility and long-term stability testing in the specific chemical matrix is mandatory before commercialization — verify by storage at 40°C / 75% RH for a minimum of 3 months with surface tension measurement at t = 0, 1, 2, and 3 months.

Package &Storage:

In 20Kg, 200Kg Plastic barrel or 1000kg, or up to clients request.

Keep in cool, dry and ventilated place. Keep away from sunlight and fire sources. Keep in unopened containers, shelf life is 24 months from the date of production. It is shipped as non-hazardous substance.

Storage beyond the shelf life does not necessarily mean that the product is no longer usable. In this case however, the properties required for the intended use must be checked for quality assurance reasons.

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