Airable
RESEARCH LAB
WHERE SUSTAINABLE SOLUTIONS START

Soy Diallyl Ether

Airable has synthesized a replacement for the common reactive plasticizer diallyl phthalate (DAP). Diallyl phthalate is commonly applied as an additive in the production of unsaturated polyester resins, specifically fiberglass-reinforced composites. These composites are used in the manufacture of boats, pipes, and automotive parts. DAP may also be used as a crosslinker in rubber and PVC formulations to improve flexibility and durability. However, like most phthalates, DAPs are toxic to humans. Airable's new chemical achieves the same allyl functionality without the hazards associated with the aromatic ortho diester associated with phthalates.

THE TECHNOLOGY

Airable's soy diallyl ether (SDE) may be formulated as a polymer additive (at 1–5 phr) as a drop-in replacement for DAP. In sheet molding compounds, preliminary studies suggest that SDE has improved impact strength at 1–3 phr. SDE contains 54% biobased carbon.

Characteristics of soy diallyl ether and diallyl phthalate

	Soy Diallyl Ether	Diallyl Phthalate
Appearance	Yellow liquid	Clear liquid
Viscosity (cPs @ 21°C)	287	13
Density (mg/mL)	1.033	1.121
Refractive Index	1.4720	1.519

Comparison of soy diallyl ether and diallyl phthalate at 1 phr in a Class A fiberglass composite

	Soy Diallyl Ether	Diallyl Phthalate	Control
Tensile Strength (MPa)	95	90	78
Young's Modulus (GPa)	11.4	11.5	11
Gardner Impact Test Mean Failure Energy (J/mm)	0.48	0.45	0.39
Unnotched Izod Impact Test Impact Energy (KJ/mm)	0.56	0.41	0.56

THE BENEFITS

The Airable formulation:

- Has 54% biobased carbon
- Is non-hazardous
- Serves as a drop-in DAP replacement
- Has no negative surface appearance at 1–3 phr
- Contains no VOCs

STATUS AND AVAILABILITY

This early-stage technology has shown promising results as a DAP replacement in sheet molding compounds. Performance evaluations are ongoing for other applications. Airable Research Lab filed a provisional patent in March 2023. Contact Airable to discuss partnership options.

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