Docket #: S21-171

Fully Miscible Antifoam Formulations

Chemical engineers at Stanford have developed miscible antifoams that are easy to incorporate and do not separate out from the target liquid during operation. With a market cap of $3.2 billion, antifoams (or defoamers) are additives used across industries to control deleterious foaming in liquids such as lubricants and diesel fuels. Usually, antifoams take the form of dispersed particles or immiscible droplets, which are difficult to incorporate and susceptible to separation from the liquid during operation. Once the antifoams separate from the liquid they are effectively useless, leading to unwanted foaming. Unlike existing products, which break up foams through either spreading or bridging-dewetting mechanisms, the new antifoams use a different physical mechanism - species concentration-induced surface tension gradients (also called Marangoni flows). This different physical mechanism makes fully miscible antifoams possible. When mixed into a target liquid, the miscible antifoam, through its relatively higher volatility, leads to surface tension gradients that cause bubble rupture up to 10 times faster than the target liquid without the antifoam.

Stage of Development
Proof of concept. The researchers are engineering more variants that can be used for a wider range of lubricants and diesels.

Applications

- Lubricant and diesel antifoam/additive manufactures such as Lubrizol and Momentive.
- Useful as a lubricant or as a diesel antifoam/additive

Advantages

- Ease of incorporation.

- Does not separate out from the target liquid
- Ruptures bubbles up to 10x faster than the target liquid without the antifoam

Publications

- Suja, V. C., Fuller, G. G., & Calhoun, S. G. (2025). *U.S. Patent No. 12,195,693*. Washington, DC: U.S. Patent and Trademark Office.

Patents

- Published Application: WO2022251469
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