

# POLARDRY® FOR MICROALGAE PROCESSING

DATA SHEET

## Microalgae's Commercial Benefits

Microalgae, also known as phytoplankton, is made up of single-celled microscopic algae. It forms an under-exploited group of natural resources (rich source of carbon compounds) that have an enormous capacity to produce a wide range of high-value natural products such as vitamins, micronutrients, Omega-3 (DHA and EPA) and Omega-6 polyunsaturated fatty acids, antioxidants, and feedstock for biofuel. Microalgae is used in health supplements, pharmaceuticals, food, biofertilizer and cosmetics. Microalgae has beneficial anti-tumor, anti-cancer, and anti-inflammatory properties.

## Readying Microalgae for Commercial Use Requires Drying

Drying harvested microalgae is time-consuming and more difficult than agricultural crop dehydration. The long drying time results in large drying costs. Microalgae can be easily degraded by high temperatures during manufacturing. It also has low storage stability and can undergo oxidative degradation triggered by light, temperature, and/or extreme pH in the presence of oxygen.

Liquid feeds of microalgae should be dried to:

- Increase shelf life and ensure stability during storage
- Preserve and protect unstable pigments
- Prevent oxidation and denaturation of the products
- Mask odors

## Challenges with Conventional Dryers

Processing microalgae with conventional spray dryers is challenging due to the use of high temperatures and the use of air as a drying gas since this combination can quickly degrade the active ingredients and preserved pigments.

Freeze drying is another method used to prepare microalgae for commercial applications, but this process is also challenging due to the need for batch processing, as well as high energy and time consumption required.



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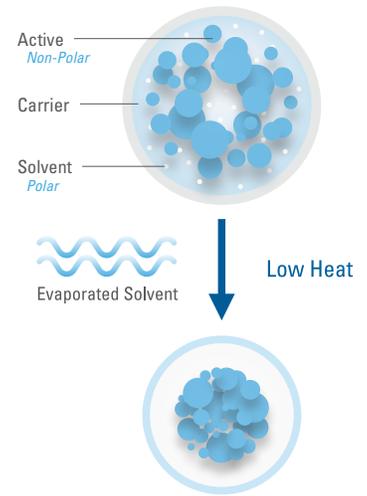


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### PolarDry® is Ideal for Microalgae Processing

The patented PolarDry technology, which employs an electrostatic charge in the spraying process, is optimal for sensitive products such as microalgae.

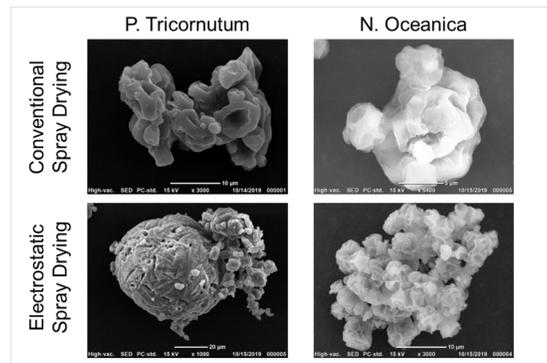
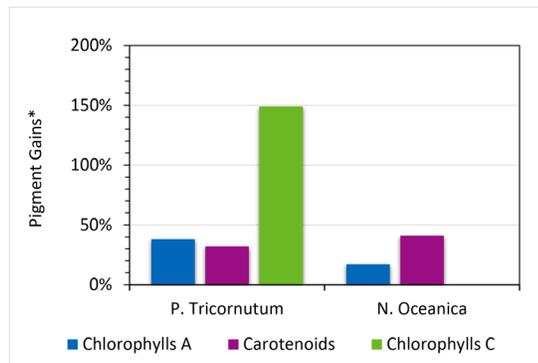
- With a feedstock based on a polar solvent, the solid materials (microalgae) are driven to the inside of the droplet, and the solvent (water) is driven to the outside, lowering the required evaporation temperature.
- The active ingredients (pigments) are protected by the formation of a thin layer of solvent on the surface of the particles during the drying.
- PolarDry uses nitrogen as the drying gas. Together with the lower temperature, denaturation and oxidation of the products are minimized.
- Superior protection increases potency, stability and product shelf life while providing superior dissolution.



### Proof of Concept: Microalgae Drying

- Microalgae tested: *Nannochloropsis oceanica* and *Phaeodactylum tricornutum*
- Results: Pigment gain. Microencapsulation with PolarDry can preserve more pigments than conventional spray dryer.
- Pigment gains = (electrostatic spray dried – conventional spray dried) ÷ conventional spray dried
- Water activity: powders processed with PolarDry have water activity below 0.3, which means powder that is more stable during storage
- Color preservation: means PolarDry prevents oxidation of the pigments
- Scanning electron microscopy photos: new structures with PolarDry means new functionalities

### Conventional Spray Drying Versus Electrostatic Spray Drying



### Conclusion

The PolarDry® electrostatic spray dryer outperformed the freeze dryer method in optimal operating conditions. Moreover, the electrostatic spray dryer has approximately the same cost as a conventional spray dryer, and this continuous process costs five times less than freeze drying.

