

# Algae Cultivation for Lab Use in Lgem PBR

## Insights in the Lgem Cultivation Systems



### Introduction

Algae are already widely used in various industries, including food, feed, pharma, nutraceuticals and cosmetics. Algae are a unique group of photosynthetic organisms that have the ability to convert light energy and carbon dioxide into carbohydrates, which can make them a sustainable source of renewable commodities. To accommodate the increasing use of algae as a resource, efficient algae cultivation systems are required. Lgem offers tubular photobioreactors (PBRs) as algae cultivation systems for both lab use and industrial-scale production. In this article, we will discuss how algae cultivation systems work, what the Lgem range of algae cultivation systems looks like, the advantages of Lgem algae cultivation systems, and algae cultivation applications.

### How Our Algae Cultivation Systems Work

Algae cultivation systems are designed to simulate the ideal conditions for algal growth. Algae cultivation systems should

provide light, nutrients and carbon dioxide for the algae to thrive. The light provides the energy necessary for photosynthesis and can be either sunlight or artificial light, while the nutrients and carbon dioxide provide essential elements for growth and development.

Two main types of algae cultivation systems exist, closed and open systems. Generally, open systems are cheap to construct but production is inhibited by lack of control, inhibition of light, carbon or nutrients, or contamination. A closed system tends to be more expensive but allows better control over the temperature, light, and nutrients, providing optimal growing conditions while minimizing contamination. A closed environment ensures that the cultivated algae are of high quality and can be used for a variety of applications.

Lgem offers tubular PBRs, which are a type of closed algae cultivation system. A two-phase flow of air and liquid is employed, improving gas exchange and mixing behaviour while minimizing biofilm formation. Lgem PBRs enable



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researchers to manipulate environmental conditions to study the effects of different parameters on algal growth and development. The design principles of our PBRs are applied to every scale, from lab- to industrial-scale making results extrapolatable.

### Lgem Range of Algae Cultivation Systems

Lgem is a leading provider of algae cultivation systems. Our range of PBRs is designed to meet the needs of researchers and producers in various sectors, such as pharmaceuticals, cosmetics, and food or feed. Lgem offers a variety of PBRs, including the Lab-5 table-top model, lab-scale models, industrial-scale models, and custom-designed systems. Our systems can be operated in batch, fed-batch or continuous mode, allowing for a range of cultivation strategies.

For in-depth analysis of algal growth and behaviour on lab-scale, Lgem offers three different solutions. Currently, the smallest and most versatile system is the Lab-25, which offers monitoring and control

of parameters such as temperature, light and pH. The Lab-25 can be used to test a wide range of conditions, optimize cultivation, or to generate high quality biomass for additional experiments. To satisfy our customers' needs, Lgem is developing a bench-top model, the Lab-5, which will allow for even more possibilities for monitoring and controlling cultivation conditions than the Lab-25. Results obtained in the Lab-25 and Lab-5 can easily be extrapolated to pilot- or industrial-scale. For further validation on lab-scale, Lgem offers the Lab-275 model, which features the same tube diameter as our industrial systems at a laboratory friendly size. Together, the Lab range of Lgem cultivation systems can help to greatly increase the understanding of your target algae or to improve your cultivation conditions. We also offer services to validate your results on an industrial-scale in our AlgaeHUB.



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### Advantages of Lgem Algae Cultivation Systems

**Ease of use:** our PBRs are user-friendly and can be easily operated by researchers with minimal training, resulting in reliable and replicable data with different users.

**Full control:** essential parameters such as pH, temperature and light intensity or light spectrum can be monitored and controlled to simulate any condition. Full control allows for extensive testing and simplifies optimization of cultivation conditions.

**High-quality algae:** our PBRs can provide optimal conditions for algal growth, resulting in high-quality algae that can be used for a variety of applications or experiments.

**Gentle mixing:** Due to the two-phase flow, Lgem does not require liquid pumps for circulation in our PBRs. This gentle mixing behaviour makes our systems suitable for cultivation of even the most fragile algae species.

**Customizable:** our PBRs can be customized to meet specific research needs. This allows researchers to further study the effects of different

environmental conditions on algal growth and development.

**Cost-effective:** our PBRs are cost-effective, making them accessible to researchers in a variety of industries and institutions.

### Algae Cultivation Applications

Due to the highly customisable design and complete control over cultivation conditions, Lgem PBRs are suitable for any kind of research. From fundamental research and modelling, to practical studies on maximizing biomass productivities, the possibilities are limitless. In addition, algal biomass generated during cultivation and experiments can be used for a wide range of applications, such as:

**Pharmaceuticals:** Algae contain a variety of bioactive compounds that are of interest to the pharmaceutical industry. These compounds are being studied for their potential use in the treatment of various diseases.

**Nutraceuticals:** Algae have a high nutrient density, including essential proteins, carbohydrates and lipids, and



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produce many different types of bioactive compounds, making algal biomass highly antioxidant. The algae can be used as a nutraceutical by itself or the bioactive compounds can be extracted to boost their effect.

**Cosmetics:** Algae contain a variety of nutrients and antioxidants that are beneficial for skin health. As a result, algae are used in a range of cosmetic products, including moisturizers and sunscreens.

**Food:** Algae are a source of essential nutrients and can either be used whole as a food supplement or ingredient or they can be refined into ingredients for the food industry.

**Feed:** Due to the high fatty acid and protein content of certain algae, they are promising alternatives to fish meal in aquaculture. In addition, algae can be used to fortify livestock or pet feed and are known to reduce methane emissions in cattle.

### Conclusion

In conclusion, algae cultivation systems are becoming increasingly important for researchers in a variety of industries. Lgem provides a range of high-quality algae cultivation systems that offer several advantages over other systems. The Lgem systems are user-friendly, cost-effective, and customizable, making them suitable for any kind of application.



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