



### Innovative glass bioreactors provide simple solutions for burgeoning biomass industry: KIMBLE® GLS 80® Wide Mouth Media Bottle and Multiport Cap—versatility, purity, and durability

At this very moment, scientists around the world are researching biofuels, biomaterials, bioactive molecules, and other biologically based technology to solve some of today's toughest scientific challenges—and this research is happening within borosilicate glass walls.

For instance, algae experts are carefully scrutinizing the light and nutrient requirements for optimal large-scale growth of these photosynthesizers,<sup>1,2</sup> an incredibly rich potential source of biofuel. Optimizing algal growth in closed, sterile bioreactor systems could be the key to unlocking an entirely renewable energy resource, one that can transform waste products—including excess CO<sub>2</sub> in the atmosphere—into energy to power the world.

In other laboratories, scientists are growing algae for an entirely different purpose—to harness the power of these green organisms to produce other valuable and useful products, such as nutraceuticals, food supplements, and bioactive molecules like carotenoids, antioxidants, vitamins, and fatty acids.

Composed of non-cytotoxic, 33 expansion, and low extractable borosilicate glass, the bioreactor bottles these scientists are using are resistant to acids, corrosive chemicals, and thermal shock. The bottles can withstand temperatures as high as 500°C, making sterilization a cinch. And with versatile multiport caps constructed from polypropylene and polytetrafluorethylene, which are autoclavable, these complete bioreactor systems alleviate contamination concerns.

Completely customizable, the glass bioreactors go beyond algae, too. Botanists are using them to culture genetically modified plant tissues in

miniature, controlled environments to identify how to best micro-propagate crops that can more efficiently feed a growing global population.<sup>3</sup> In these conditions, light is the key—which is why >90% transmission of visible light (380–700 nm) makes the new KIMBLE® GLS 80® line the perfect glassware for photosynthetic bioreactors.

Bioreactor 4 Port Multiport Cap



KIMBLE® GLS 80®, 1000 mL  
Media Bottles DWK Catalog Number 14393-1000,  
Multiport Cap DWK Catalog Number 293109103

In addition to photosynthesis, microbiologists are also using the bioreactors to optimize growth conditions of microorganisms that can anaerobically digest biomass—where the glass's resistance to acids and corrosive chemicals is a must—to convert organic wastes into biogas, another highly valuable and highly renewable bioenergy resource.<sup>4</sup>

### VERSATILITY

#### PHOTOBIOREACTOR:

In certain research areas, visible light is undesirable; for instance: some anaerobic microorganisms, such as methanogens, are light sensitive; production of bio-hydrogen requires dark fermentation; and, some culture media may contain light-sensitive compounds. No matter what the research need, KIMBLE® GLS 80® glassware is the simple solution.

#### UV PROTECTION:

The GLS 80® line is available with an outer amber coating that affords UV light protection up to 500 nm, providing a unique environment for photosensitive studies.



Exterior amberization keeps inside virtually inert

This durable light-protective coating is fused to the outer glass surface while the inside of the bottle remains virtually inert, eliminating potential effects on the valuable research happening within its walls.

## Bioreactor Bulletin . 01

Biomedical researchers are painstakingly monitoring a set of these sterile bioreactors, where human stem cells are growing on polymer scaffolds<sup>5</sup>—molding replacement noses, ears, and other organs that can serve as substitutes when the human body cannot heal itself.

Biomaterials scientists cultivating microorganisms that churn out biopolymers, which can be harvested and processed into a more sustainable form of bioplastics, could use rows of these bioreactors to sufficiently propagate large quantities of useful microbes.

In each of these research environments, KIMBLE® GLS 80® wide mouth glass bottles and multiport cap systems provide unique solutions for the evolving role of laboratory glassware in today's research—from passively holding reagents to an active role as bioreactors and more.

With improved accessibility through the wide mouth, the GLS 80® line offers new opportunities for laboratory glassware. The innovative multiport cap system contains four ports integrated directly into the bottle's screw cap, permitting sterile liquid transfer to and from the closed system. Entirely flexible and modular, the system can accommodate various sized tubing fed through the ports, with optional filters and inserts to provide tailored solutions.

Offering unprecedented versatility, purity, and durability, the KIMBLE® GLS 80® glassware and multiport cap system can be custom-fit to each unique research need.

**KIMBLE® GLS 80® Media Bottles and Multiport Closures** are available from DWK Life Sciences. For more information or to place an order, visit DWK Life Sciences at [www.dwk.com/bioreactor](http://www.dwk.com/bioreactor) or call toll free 1-800-225-1437.

### REFERENCES:

<sup>1</sup> J. Vanags, L. Kunga, K. Dubencovs, V. Galvanauskas, M. Balode, O. Grigs (2014). The effect of shaking, CO<sub>2</sub> concentration and light intensity on biomass growth of green microalgae *Desmodesmus communis*. *Environmental Research, Engineering and Management* 70(4). <http://dx.doi.org/10.5755/j01.arem.70.4.8437>

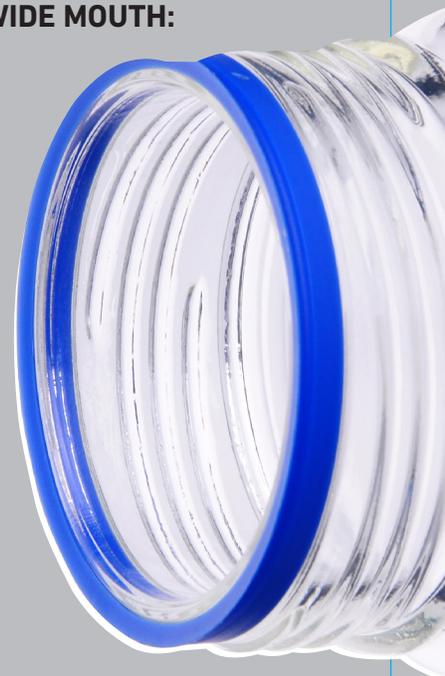
<sup>2</sup> X. B. Tan, Y. Uemura, J. W. Lim, M. K. Lam (2017). Cultivation of *Chlorella vulgaris* in photobioreactor by using compost as a nutrient source for biomass production. *Journal of Fundamental and Applied Sciences* 9(6S). <http://dx.doi.org/10.4314/jfas.v9i6s.23>

<sup>3</sup> K. Thanakornpaisarn, A. Kongbangkerd, S. Premjet, D. Premjet. Micropropagation of banana (*Musa spp.*) cv. Mali-Oung (ABB genome) by temporary immersion bioreactor (TIB). [bit.ly/2xdbJ68](http://bit.ly/2xdbJ68)

<sup>4</sup> S. Van Den Hende, C. Laurent, M. Bégué, V. Beelen, H. Vervaeren (2014). Biochemical methane potential of wastewater-grown microalgal bacterial flocs: influence of pretreatments. XI Simposio Latinoamericano de Digestión Anaerobia, Resúmenes. Presented at the 11. Simposio Latinoamericano de Digestión Anaerobia. <http://hdl.handle.net/1854/LU-5802137>

<sup>5</sup> Associated Press. "Sci-fi meets reality as stem cells are turned into noses, ears." April 8, 2014. <https://nypost.com/2014/04/08/scientists-turn-stems-cells-into-noses-ears>

### KIMBLE® GLS 80® WIDE MOUTH:



- Composed of virtually inert material that is easy to sterilize
- The wide mouth allows for effortless access and clean up
- Accommodates a multiport cap that allows for probe access or liquid and gas transfer

### PRODUCT SPECIFICATIONS:

Capacity (mL)	OD (mm)	H (mm)
250	95	105
500	101	152
1000	101	222
2000	136	252
5000	182	314
10000	227	389
20000	288	484

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