

Bubble Removal From Aqueous Streams Using SuperPhobic® Membrane Contactors

Many manufacturing processes, analytical measurements, and other industrial processes and procedures that involve aqueous based solutions, are adversely affected by bubbles in the fluid stream. SuperPhobic® Membrane Contactors provide a very simple, cost effective solution to eliminate bubbles from your process.

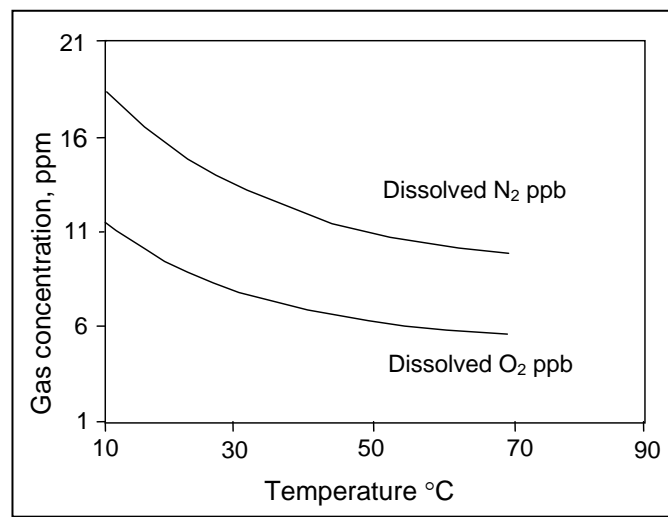
Background

When liquids and gases are brought into contact, mass transfer between the gas and liquid phases will occur. The concentration of gas dissolved in the liquid will continue to increase until equilibrium is reached. Once equilibrium is reached, the concentration of gas in the liquid will remain constant. When gas concentrations in a liquid reach this point, the liquid is said to be “saturated”. Specific quantities of gases that are dissolved into the liquid depend on liquid and gas physical properties as well as equilibrium temperature and pressure conditions. The point at which a liquid is saturated with a given gas will typically occur very quickly. For this reason, and without additional information, design engineers must assume a liquid stream is saturated with any gas that has come into contact with the liquid.

Bubble Formation

Once a liquid process stream has become saturated with a given gas or gas mixture, the concentration of the gases in the liquid will remain constant until equilibrium conditions change. For example, an increase in system pressure will cause gases to dissolve into the liquid stream. A decrease in system pressure will cause gases to be released from the liquid in order to re-establish equilibrium. When gases are released in this manner, bubbles form in the liquid. These bubbles can create problems for manufacturing processes. For example, if the liquid is used in a cleaning or coating process, these bubbles can adhere to product surfaces causing defects at each site where a bubble occurs. These defects can cause significant product yield losses.

Figure 1: Dissolved gas concentration in water at atmospheric pressure.



Bubble Prevention and Elimination

SuperPhobic Membrane Contactors offer a cost-effective and simple way to prevent and eliminate bubble formation. Listed below is one example that demonstrates the effectiveness of SuperPhobic Membrane Contactors for yield improvement.

Application:

A customer is processing a coating solution that is heated prior to application. The solution is prepared at 20°C and then heated to 60°C. The heating step causes significant offgassing of the solution. Venting the solution removes excess gas, but is ineffective in maintaining dissolved gases at a consistent level during manufacturing runs. As a result, product yields vary over time.

Solution:

The difficulty with simply venting the excess gas is that the coating solution is still saturated with gases at the conditions where the solution was vented. Any further pressure reductions and/or temperature increases create additional bubbles. Placing a SuperPhobic® Membrane Contactor inline before the heater eliminates any bubble formation. In figure 1 the gas content of the liquid at 20°C and

60°C is shown. By knowing the gas concentration of the fluid at 60°C, a membrane contactor system can be designed that reduces the gas concentration well below any process condition where gas could develop. This can completely eliminate the possibility of bubble formation. Due to the high efficiency of SuperPhobic Membrane Contactors, using only a single membrane contactor will be adequate to reduce the gas concentration to satisfactory levels. In Figure 2 a process flow schematic is shown of a typical system designed to eliminate bubbles. Bubble removal systems utilizing SuperPhobic Membrane Contactors offer several distinct advantages over existing technologies. Some of the advantages are:

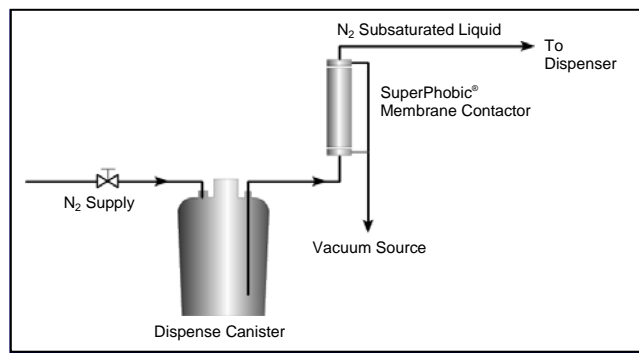
Modularity. Membrane systems are inherently modular. This provides operational flexibility in that the system can be easily and economically adjusted to accommodate process changes.

Small footprint. SuperPhobic Membrane Contactors can be packaged into compact configurations. In addition, systems can be custom designed to fit into existing space constraints. Point-of-use systems can also be designed.

Ease of operation. With almost no instrumentation, SuperPhobic Membrane Contactors are very simple to operate.

Consistency. Gas content in liquid process streams can be maintained very precisely even with simple process control systems.

Figure 2: SuperPhobic Membrane Contactor flow schematic chemical delivery system..



For more information on bubble removal in process streams, please contact your Membrana representative or visit our web site at www.liqui-cel.com.

This product is to be used only by persons familiar with its use. It must be maintained within the stated limitations. All sales are subject to Seller's terms and conditions. Purchaser assumes all responsibility for the suitability and fitness for use as well as for the protection of the environment and for health and safety involving this product. Seller reserves the right to modify this document without prior notice. Check with your representative to verify the latest update. To the best of our knowledge the information contained herein is accurate. However, neither Seller nor any of its affiliates assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of the suitability of any material and whether there is any infringement of patents, trademarks, or copyrights is the sole responsibility of the user. Users of any substance should satisfy themselves by independent investigation that the material can be used safely. We may have described certain hazards, but we cannot guarantee that these are the only hazards that exist.

Liqui-Cel, Celgard, SuperPhobic and MiniModule are registered trademarks and NB is a trademark of Membrana-Charlotte, A division of Celgard, LLC and nothing herein shall be construed as a recommendation or license to use any information that conflicts with any patent, trademark or copyright of Seller or others.

©2008 Membrana – Charlotte A Division of Celgard, LLC (TB25Rev3_10-05)

Membrana - Charlotte
A Division of Celgard, LLC
13800 South Lakes Drive
Charlotte, North Carolina 28273
USA
Phone: (704) 587 8888
Fax: (704) 587 8585

Membrana GmbH
Oehder Strasse 28
42289 Wuppertal
Germany
Phone: +49 2020 6099 - 658
Phone: +49 6126 2260 - 41
Fax: +49 202 6099 -750

Japan Office
Shinjuku Mitsui Building, 27F
1-1, Nishishinjuku 2-chome
Shinjuku-ku, Tokyo 163-0427
Japan
Phone: 81 3 5324 3361
Fax: 81 3 5324 3369



ISO 9001:2000
ISO 14001:2004

MEMBRANA
Underlining Performance

www.liqui-cel.com

A **POLYPORE** Company