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Ultrasonic liquid processing as a method of high viscosity adhesive degassing

When searching for a method to quickly, thoroughly, and efficiently degas a high viscosity (approx. 4000 cP) liquid adhesive I stumbled upon ultrasonic technology as a promising alternative to standard vacuum chamber degassing. Upon contacting Qsonica, I was put in touch with a knowledgeable, helpful staff that quickly set me up with a complete ultrasonic liquid processing system, the Qsonica 600 watt Sonicator with a .5" diameter probe.

The principle behind ultrasonic degassing is that acoustic waves applied to the sample subject the fluid to high frequency cycles of high and low pressure. In these low pressure regions, voids are formed within the sample at and very close to the focal point of the probe. These voids are essentially tiny pockets of vacuum, providing sites for dissolved gasses in the surrounding liquid to coalesce into bubbles; the amount of gas that is brought out of solution is governed by Henry's law. This is the same physical principle that causes traditional vacuum degassing processes to work except that with acoustic waves, the surface of the liquid is not the contact point with the vacuum.

Some important notes that affect the degassing process are as follows:

- A key to the removing the expunged gas from the liquid is cycling the system on and off so that in the on periods the acoustic waves remove the gas from the solution and in the off periods the bubbles that were created are allowed to rise thanks to buoyancy forces and break at the surface. The Qsonica software makes it very simple to program a cycle.
- The addition of energy into the system causes an inherent temperature increase, which means that for temperature sensitive liquids like this specific adhesive, the temperature must be monitored. Qsonica has made this an easy task by allowing a thermocouple to be integrated into the system. The software allows the temperature to be monitored and even allows for a system shutoff temperature to be set. The temperature increase can be controlled by either having the liquid in an ice bath or by having longer off periods in the cycle.
- As was expected, letting the temperature increase to a point where the viscosity decreased allowed the formed bubbled to exit the liquid quicker, therefore decreasing the total degassing time.

A typical degassing laboratory degassing run is as follows:

Sample size	30 ml
Tip amplitude	25%
Pulse settings	5 seconds, 20 seconds off
Probe depth	≈.25 in
Probe dia.	.5 in
Beaker size	50 ml (dia: 1.625 in)

Overall, ultrasonic degassing was highly effective to degas a viscous liquid adhesive in significantly less time than traditional vacuum methods. Qsonica makes great products but not only are their products great, they have a knowledgeable, friendly staff that is quick to respond to questions. I could not have asked for a better experience learning how to utilize new technology.

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