The Honeycomb Mold – Natures Technology

by Helen Stokes

The conference theme is 'Forming Frontiers'. For me this means the opportunity to travel long distances from my home 'down under', to meet old friends, make new friends and exchange ideas. I like to think that conferences such as the Gas Conference enable me to advance frontiers. There is no limit to the attainment of knowledge and after attending such meetings, I always return home enriched with new ideas, different concepts and techniques.
The word 'Frontiers' has another exciting meaning for me. In nature there are many natural frontiers. Examples that readily come to mind in my country are the coastline and mountain ranges that are sources of great beauty and are the environments which have unique fauna and flora. These environs have provided me with a wealth of ideas and inspiration to transform into the glass medium. My love of frogs since childhood and fascination with the rocks and shells around Pambula Beach which is located on the southeast coast line of New South Wales in Australia have been my primary source of inspiration for recent works.

Design is only limited by the artist's imagination, experiences, resources and particular familiarity with the medium with which he or she works. Artists in their natural evolution will expand their conceptual ideas but often the medium will restrict the potential success of the finished piece. In my case the block mold was cumbersome and unforgiving. It did not allow my fine glass sculptures to cast without breaking. Often the mold would crack with frustrating results, so there was the need for a new molding process.

I pioneered and developed the Honeycomb Mold in Melbourne, Australia.
The honeycomb mold evolved over 6 years and is continually being refined and its usage explored. It is stronger and lighter than the traditional block mold and is cast without air vents. In this article I will briefly describe how the mold is made and discuss what changes have been made since 2004 when I demonstrated the mold at the GAS conference in New Orleans.
In this demonstration the honeycomb process will be similar to 2004. However, the focus will be on how it is used to re-enforce corners, support localized areas, provide better ventilation and drainage, and where the honeycomb structure is best not used.
There is a detailed description of how to make the honeycomb mold in the 2004 GAS Journal. This article can also be found on my web site www.stokesglass.com.au or email me: helen@stokesglass.com.au

In 2004 I believed that the honeycomb structure would move or collapse as the mold cooled to allow the glass to contract. I have since found that the honeycomb retains its integrity throughout the firing and have had the cup of a goblet break because the honeycomb inside it was too strong. Discretion is needed as to where the honeycomb should be placed in a mold. Honeycomb is best used on the outer surfaces of the mold face where the layers of the mold are structurally sound but move independently. Inside cavities are supported by the layers. Fiberglass is included in several of these layers

which gives adequate support. The combination of layers and fiberglass equates to a bending strength of approximately 2.5%.
The honeycomb structure can be used for strengthening corners where the glass pressure is greatest and help support the walls that hold larger quantities of glass. However, the honeycomb is only strong when the inner and outer fiberglass skin bounding it is secure and the plaster and silica outer backing is of adequate thickness for the size of the mold. The mold can withstand temperatures of 1660oF (860oC) for more than 12 hours and remain stable and secure.
The honeycomb can be placed on the thin edge of a delicate form such as a bowl or vessel to help the air escape during firing. It will also serve as a buffer to protect a delicate edge. The honeycomb structure allows the air to flow easily through the mold, facilitating an even heating and cooling process. Drying the mold is accelerated because the structure of mold is not as dense and the moisture escapes along the natural channels made by the fiberglass strands. It is beneficial to use the honeycomb structure in a mold for strength and ventilation, but use it sparingly inside delicate structures.

The Honeycomb Mold is made of layers of Dental Plaster and Silica Flour combined with water. Fiberglass is added to several of these layers.

1. The first layer is a 50/50 mix of Dental Plaster and Silica Flour (by volume) mixed with water. It is brushed over the surface of the wax model to increase surface adhesion. The remainder of the mix is poured over the mold to make a layer of approximately 1/8 inch-(5mm) thick. Allow the plaster to flow down to form a 2 inch collar around the base of the mold.
2. The second layer is a fiberglass skin made by dipping split fiberglass squares one at a time into a new mix of plaster and silica. The first square is placed at the bottom edge of the mold. This process is repeated overlapping the squares to make a row around the base. Subsequent rows overlap the previous rows until the entire surface of the mold is covered. Gently squeeze the mold to remove the wet plaster from behind the fiberglass working from the top to the base.
3. The honeycomb layer is made by dipping a fiberglass square into a mix of plaster and silica. The square is held on diagonally opposite corners and twisted half a turn in opposite directions. The corners are then pushed together and the twisted square placed on the plaster collar at the bottom of the mold so that it just lightly touches the fiberglass skin. Continue this process working around and upwards until the mold surface is completely covered. The honeycomb must maintain contact with the skin of the mold.
4. An outer fiberglass skin is to be placed over the honeycomb. This skin is made either of larger fiberglass squares or fiberglass ribbon dipped in the plaster and silica mixture. Care must be taken when applying this skin so as not to fill the honeycomb cavities with plaster which would defeat the function of the honeycomb.
5. The final layer can be made of Potters Plaster and Silica Flour (50/50) or can have grog added - 1/3 of each ingredient -- for extra strength. The thickness of this layer will depend on the size of the mold and can range from ¼ inch (1cm) to 2 inches (5cm). This layer should be made with one mix of plaster for over all strength.
6. The wax can be steamed out when the mold has cured.

7. The honeycomb mold must NOT be rinsed with water for any reason. The water would fill the honeycomb cavities and weaken the mold structure.
Handle the mold with care when it is damp as it can be damaged.
The mold is made without air vents. Because of this the mold is fired for a longer time at top temperature to allow the glass to fill all the cavities. If there was an air vent then the glass would flow through the air vent and into the cavity of the honeycomb and be wasted. The mold would not have its full quota of glass.

The honeycomb mold process is a new way of forming a mold to cast glass and I have found it invaluable when casting specific forms. My wish is that this mold will be used by many glass artists to help them realize their visions in glass and that will pass the technique on to others. – Helen Stokes

Helen Stokes lives in Melbourne, Australia, and has worked with glass since 1978. At that time she made Tiffany-style lampshades and three-dimensional panels using the copper foil technique. In 1995, Helen graduated from Monash University (Melbourne) with a Post Graduate Diploma of Ceramic Design majoring in Glass. Casting glass became her passion, and she developed the honeycomb mold that she has taught to students at workshops in Switzerland, Australia, and the United States.

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