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Henry T. Hellmers' Secret Batch Book of Glass Formulae, Henry Theodore Hellmers, J. W. Courter, Igneous Glassworks, 2011, 0983703817, 9780983703815, . This is an important reference in glassmaking in America 1921-1965 Some of Mr. Hellmers' history and work experiences are included here. Various employment history notes when he worked at companies such as: Making marbles at AKRO Agate Company, Westite, Cambridge Glass Co., Making glass lamps at Aladdin Industries, Making Optics at Lancaster Lens Co., Owens Corning Fiberglass, Glass Fibers Co., Pittsburg Corning, Heisey Glass, Erickson Glass, L.J. Houze, Convex Glass Co. etc. His entire handwritten Batch Book including 2373 formulas detailing the coloring of glass batches has been reproduced in sections; Alabaster or Opalescent, Moonstone, Opal, Black or Ebony, Transparent Color, Crystals, Special Use Glasses, etc., each with numerous color formulas!

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Journal of the Society of Glass Technology, Volume 39 , Society of glass technology, Sheffield, Eng, 1955, , . .

Chemical approach to glass , Miloš Bohuslav Volf, 1984, Technology & Engineering, 594 pages.

This is an important reference in glassmaking in America 1921-1965 Some of Mr. Hellmers' history and work experiences are included here. Various employment history notes when he worked at companies such as: Making marbles at AKRO Agate Company, Westite, Cambridge Glass Co., Making glass lamps at Aladdin Industries, Making Optics at Lancaster Lens Co., Owens Corning Fiberglass, Glass Fibers Co., Pittsburg Corning, Heisey Glass, Erickson Glass, L.J. Houze, Convex Glass Co. etc. His entire handwritten Batch Book including 2373 formulas detailing the coloring of glass batches has been reproduced in sections; Alabaster or Opalescent, Moonstone, Opal, Black or Ebony, Transparent Color, Crystals, Special Use Glasses, etc., each with numerous color formulas!

As some one that makes my own sheet glass for my own leaded glass windows, this book is like a roadmap. While my melts are no more than 60 pounds and he is melting usually over 1,000 lbs, the formulas just need to be scaled down. I'd say this is an essential book for anyone making their own glass, glassblowers included.

A unique and important book of glass- and marble-making history can now be yours in the recently published Henry T. Hellmers' Secret Batch Book of Glass Formulae, by J.W. Courter. Marble collectors who study the history of their hobby will want to secure a copy of this book. I have to say there is nothing else like it in my library.

Just as the title describes, it is a facsimile of the 400-page, handwritten glass formulae book of glass chemist Henry T. Hellmers (1897 - 1978). Hellmer worked at many glass making companies during his 40+ year career, including Akro Agate Co. from 1921 - 1930, where he helped develop, as he

put it, "hundreds of colors" for their new machine made marbles. He also worked at the Cambridge Glass Company from 1930-1932, where he developed several of their famously vivid colors.

Hellmers' batch book illustrates the depth and breadth of his role in American glass making history. The book includes more than 2,300 formulae for coloring glass batches, each written in the same format in good handwriting. Hellmers not only invented many colors but also collected formulae from other companies, so dozens of glass making companies are referenced. There are formulae for lenses, crystal, even red reflectors for cars and bicycles. Of particular interest to marble collectors are the entries for the Akro Agate Co.

The formulae themselves, when you consider their ingredients, are like alchemy. Each batch contains hundreds of pounds of sand and soda, and then, depending upon the color, lesser amounts of "secret" ingredients that to a layman like me seem magical. Tiger Eye Red, for example, calls for 500 lbs. of sand but only 2 ½ oz. of copper oxide and but ½ oz. of bichromate. Bone ash seems to be a common ingredient.

And the formulae just go on and on for 400 pages, sprinkled with fascinating tidbits from the history of glass making. On page 120, I found an Akro Agate batch formula for Lavender Opal attributed to A. Fiedler and dated 1923. Just below it is another formula, from 1916, by H.C. Hill. Anyone familiar with Akro Agate's history will recognize those two names.

Reading these, especially the formulae apparently created by Hellmers which are initialed H.T.H, I can almost picture him standing near the pot or tank with the furnace glow on his face, making sure his colors come out just right. This unique and very personal piece of history has given me a deeper appreciation for the chemistry and the people behind these gleaming little glass globes.

Henry Hellmers was a glassmaker who worked for a number of different American glass companies and kept a recipe book containing many of the recipes used by those companies, as well as many he collected from various other sources. There are over 2300 glass recipes in the book, many (most?) of which were actual recipes used in glass factory production in the early to mid 1900's. A very large number of these are for colored glass.

Mr. Hellmers' notebook of glass recipes has been reproduced in sections covering; Alabaster or Opalescent glass, Moonstone, Opal, Black or Ebony, Transparent Color, Crystals, Special Use Glasses, etc. A total of 2373 glass recipes in all, both his personal recipes as used in industry, and those he collected from a variety of other sources. Many of these recipes can easily be adapted for studio use by anyone with a reasonable amount of glassmaking knowledge. Even without doing that, this book is a great resource just on the historical aspect of the recipes alone.

This is a reprint of a book that is not widely known because the first printing about 10 years ago consisted of a grand total of 25 copies, all of which (I think) went to libraries and collectors. I stumbled across it at the Rakow Library at Corning shortly after that original publication and subsequently spent a couple of days photocopying the glass recipes in it. There are over 2300 of them! A huge number of those - like the ones pictured on the page posted below - are for colored glass.

The publisher's list price for this book is \$50. My selling price, which includes free Media Mail shipping to the USA, is \$42.95. No international orders at the moment, but that could change if interest warrants. Payment is through Paypal only. There are a limited number of books available, but again, if interest warrants I will buy another batch of them to sell.

The images below are of a couple of the pages from the Hellmers book. All of the glass recipe pages have this layout - ingredients listed on the left, quantities of those ingredients in columns with each column representing one particular glass, and the origin of the recipe at the bottom of each column. As you can see, the pages pictured below are for transparent ruby glass recipes, one with six different selenium ruby recipes, all of which came from the Lancaster Lens Company in the 1920's and 30's, and the other with six gold ruby recipes of the Sandwich Glass Company, from the

late 1800's. If you've always wanted to know what ingredients are in various types of colored glass, you will never find a better book than this.

The most common ingredients used to opacify typical soft glasses (like we use) are compounds of fluorine and/or phosphorus, with fluorine being more common. Also, a hefty helping of arsenic will turn a lead glass dead opaque, and is what is used as a base glass for many (most?) opaque colored glasses with "enamel" in their name. Various combinations of these materials are also used, such as glasses containing both fluorine and phosphorus. Both lead arsenate and fluorine emit fumes while melting. Breathing them won't improve your health at all.

Since potters use substantially the same chemicals as glassmakers, just in different proportions, nearly all the chemicals necessary for making glass can be obtained from a good ceramic supplier, such as Laguna Clay or somewhere similar. They will also usually be considerably cheaper than if bought from a scientific supplier. However, as was already pointed out by someone else, many of these chemicals - particularly the colorants - are hazardous. So if you don't know what you are doing you can put yourself in a world of hurt.

Henry Hellmers developed the formulas for six colors of glass during his brief period of employment by the Cambridge Glass Company from 1930 to 1932. To this point, we have reviewed the formulas and related information for four of those colors: Crown Tuscan, Carmen, Royal Blue, and Heatherbloom. Amethyst is the topic of this article, and that will leave Forest Green as the topic for a future article.

The key source of information for all of these articles is Henry T. Hellmers' Batch Book of Glass Formulae that was published in 2002 by J. W. Courter, Kevil, KY. Dr. Courter donated two copies of the Hellmers batch book to NCC during the 2002 convention - one copy for the NCC museum and another copy to be used as a fundraiser. As mentioned in the August issue of the Crystal Ball, the "fundraiser" copy topped the silent auction that was held during the 2003 convention of NCC.

Previously, during the 1920s, Cambridge produced another transparent amethyst-colored glass named Mulberry. The Colors book indicates that, "Mulberry, introduced in 1923, is a medium to deep shade of amethyst in a rather dull transparent color. It will not show the sparkling beauty found in the later issue of Amethyst".

A formula for Amethyst appears in the Hellmers batch book, and the formula is dated to 1932 and has a notation that it was used for both pressed and blown ware. Another batch book provides the formula for Mulberry from the 1920s, and the ingredients for the two formulas are (units are pounds except as noted):

The major colorants in both formulas are manganese and powder blue. In conjunction with soda, manganese produces a reddish-violet color. Powder blue is a dilute form (about 5%) of cobalt oxide and, of course, imparts the color blue. Only 1 ounce of powder blue was used in both formulas and this, once again, demonstrates the tremendous coloring power of cobalt oxide. A secondary coloring agent in both formulas is arsenic, because arsenic counteracts the green-coloring properties of iron, which often is an impurity in ingredients. Furthermore, arsenic assists in removing bubbles from glass. For Mulberry, antimony oxide plays the same dual roles that arsenic plays. I have found no explanation for the small amount of tin oxide as an ingredient in Mulberry.

The major differences in the formulas of Amethyst and Mulberry are the substantial amounts of feldspar, nitrate, red lead, and borax in Amethyst, and the lack of all four of these ingredients in Mulberry. Feldspar is a source of alumina, which improves the durability of glass. Nitrate accelerates the melting of a batch of glass, and red lead helps to secure an oxidizing condition in molten glass. Borax is a solvent for all of the metallic oxides that are ingredients.

None of these four ingredients are essential to make glass, and none are direct colorants. All four of these ingredients, however, improve the "quality" of glass, especially by improving the melting environment. This probably explains the difference in Amethyst and Mulberry regarding depth and

warmth of color and sparkle.

On the other hand, salt was an ingredient in Mulberry. According to the book, *Modern Glass Practice* by Scholes and Greene, salt prevents scum from floating in molten glass. Without the "quality" ingredients of feldspar, nitrate, red lead, and borax, Mulberry probably required salt to prevent scum from forming in the batch.

When you think of colors of Cambridge glass, which ones come to mind? Probably the very vibrant colors, which are most popular and most sought by collectors of Cambridge glass. Let's see, those colors probably would include: Carmen, Royal Blue, Amethyst, Forest Green, Heatherbloom, and Crown Tuscan. All of these colors were introduced by the Cambridge Glass Company during 1931 and 1932. These six colors share something else in common. They were all developed by Henry Hellmers, a glass chemist who was employed by the Cambridge Glass Company from 1930 to 1932.

Most notably, Henry Hellmers had a profound effect on colored glass produced by many of the major manufacturers of American-made elegant glassware during the '20s, '30s, and '40s. Besides working on a full-time basis with the previously mentioned companies, he worked on a contract basis and consulted with Heisey, Fostoria, Economy (Morgantown), and Erickson, just to name a few glass companies. He was responsible for perfecting the formulas of some of the most desirable colors produced by many of these companies. Also, he was a master at tweaking formulas to make glass that had the color, clarity, and practical workability that was desired by glass manufacturers.

J.W. (Bill) Courter is the Bright Knight of the Aladdin Knights, which is the collector group for items produced by Aladdin Industries. The primary product of this company was their famous Aladdin lamp made in many different colors of glass. Aladdin also produced glass items other than lamps. I have had the pleasure of becoming acquainted with Bill Courter and his wife, Treva, and have spent time with them in their home. Bill is in the process of publishing Henry T. Hellmers' *Batch Book of Glass Formulae*, and he will provide a copy of the book to the NCC museum. I have had personal inspection of the Hellmers' batch book, and there is little doubt that the book should provide additional insight into the colored glass produced by the Cambridge Glass Company.