

Problems with unstable glasses manufactured in Europe and Asia during the 17th to 20th centuries.

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Unstable glass compositions are known in Europe as early as the 17th century, when glass manufacturing workshops in Venice, Western Europe and England were experimenting with new glass preparations in order to achieve crystal clear glasses. These developments led to the manufacture of numerous unstable glasses that now exhibit various stages of glass “disease”, more commonly known as “crizzling” and “weeping”. Unfortunately, the Western European glass manufacturers then influenced glass production both to the East (Asia) and to the West (America), bringing recipes for similar unstable glasses.

We are now able to distinguish some of these influences, and the reasons behind them. Dr. Robert Brill, retired Research Scientist from the Corning Museum of Glass has analyzed numerous European, Asian and American glasses and has found similar compositions that indicate these glasses had excess amounts of alkali, mainly potassium and sodium carbonates, and too little stabilizer (CaO). Initially, this was undoubtedly an advantage for the glassblower, because these glasses were softer and remained more fluid at lower temperatures. The glass melts were easier to work into very complicated shapes, and produced a much more beautiful clear glass. However, over time, and exposure to fluctuating environments during use and storage, these high alkali glasses are subject to hydration, and eventual breakdown of the glass structure (crizzling).

Continuing research indicates that many more glasses are sensitive to this atmospheric deterioration, but it is difficult to always predict. Non-destructive analysis, such as X-ray Fluorescence Analysis can help identify some, but not all of the elements in a glass composition, and new advances are being made in comparing these results to earlier destructive quantitative analyses (electron microprobe or mass spectrometry), and now better compositional results using Laser Ablation (LA-ICPMS).

It is interesting to see that some of the earlier glass manufacturers realized that they were producing unstable glasses, for example in England, Ravenscroft in 1676 actually stopped production for a time to rework their glass compositions. Similarly, advances were also achieved since the founding of the first royal glasshouse within the Imperial City in Beijing in 1696.

Earlier glasses, such as Roman soda-lime-silica glasses show very little or no

such problems of instability. This is partly a result of the well-balanced glass compositions, and the fact that burial creates a different protective phenomenon, that of weathering layers on the glass that are a result of centuries of alkali loss prior to excavation.

There is no complete conservation treatment to restore damaged crizzled glasses.

Prolonged high humidity can cause extensive alkali hydration, with eventual dissolution of the silica matrix. Cleaning or rinsing the glass with deionized or distilled water is recommended to remove any accumulated alkali on the surface. Previous damage to these deteriorated glasses can be treated and storage in a controlled environment of 40-42 % RH, with circulating air movement, appears to slow down or almost stop any further advancement of deterioration.