

Investigation of Construction and Application of Colored Flat glass in Iranian Architecture

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Introduction

The art of glass making was invented and started by the Romans and enhanced by the development of the use of Chinese knots and door and window making. This art has a long history in Iran. However, the use of flat colored glass in architecture in the Safavid and Qajar periods has been due to some reasons. Among these reasons, one can refer to the characteristics of glass, climatic conditions, the the Safavid kings' interest in glass arts, and the creativity of architects to borrow the pattern of flat glass windows, in the form of the stained glass method, practiced in churches of the same period in the West. The use of colored flat glass to create decorative windows originated in the Romans and Constantinople. The art of glassmaking requires special and diverse raw materials. Generally, complex methods are used in its construction. Glass is made of compounds such as silica in the form of sand, alkali in the form of sodium and potassium as flux, lime for strengthening, lead oxide for transparency, and metal oxides for creating different colors.

Research Method

The manufacture of flat-colored glass in Iran has not been discussed yet in the available sources. In the present research, an attempt has been made to answer the question of how this type of glass was the produced in Iran, and how the commercial and cultural relations have affected this process. The nature of the research is descriptive-analytical, and its method is qualitative. The collection of information and samples has been done in a library manner. After collecting data and analyzing and classifying the manufacturing methods of flat colored glass, the factors affecting their production have been examined.

Research Findings

Stained glass windows were used in three ways in the Qajar period. The first way is a patterned glasswork made with colors such as red, blue, emerald green, and yellow. This glasswork was used in small semi-circular windows and sash windows in the strips. The second method was glass mosaic that was first used in the late Safavid era and, then, it was fully expanded in the Qajar period. In the third method, on the plastered surface, a border of repeated motifs of scrolls and vases was inlaid in pieces of red, green, and blue colored glass. To produce cup (bed) glass, it consisted of 97% silica powder, sodium carbonate, and lime, and the remaining 3% was coloring and pigment oxides. The production of this type of glass was done using different methods, including blowing, casting, rolling, stretching (horizontal and vertical), and floating or flute.

At first, the production of uniform glass was done by forming circular and cylindrical shapes and, then, the flattening of them. Before the invention of the float method in the 19th century, uniform glass was made in two basic ways: one of these methods was sheet or window glass, and the other was plate glass.

The colored glass was first used by the Romans. The origin of the use of colored glass was traced back to Constantinople, where it was used in the church in the 6th century AD. There were two ways to paint flat glass: surface and brain. Making colored flat glass was usually done by adding a metal to the molten glass.

Due to the expansion of political relations with the West, Shah Abbas brought expensive Venetian glass to Iran to promote this industry; this industry continued until the Qajar period. During the Qajar era, due to the incapability of hand-made glass workshops to meet the consumption and decorative needs of the country, glass goods were imported from other industrial countries and replaced the hand-made glass. Also, this period coincided with the Industrial Revolution, and with the expansion of foreign relations with European countries, handicrafts faced the challenge of industrial goods. Among other social factors influencing this art from the Safavid to the Qajar eras, one can refer to the use of mirror work, especially cup mirrors in the harems which became popular due to the eye-catching brilliance as well as the halo of sacredness surrounding the kings of this era. Since mirror created a remarkable space, they were not reluctant to experience such space. This had an impact on the use of mirror work in religious buildings such as Imamzadehs, and they joined this movement from the Qajar era. A growing interest in the development of knotwork and door and window-making promoted the use of colored glass in the Qajar and Pahlavi periods.

Conclusion

The obtained results showed that the use of colored flat glass to make decorative windows was first used by the Romans and originated in Constantinople. The production method of flat glass in Iran was on the back of a shovel and of very poor quality. Thus, the method of making glass imported to Iran was manual, done by blowing method (including two types of crown, and cylindrical or cylinder), as well as casting or rolling ones. Also, the coloring of these glasses was done by adding colored oxides; it was done in two ways: surface and brain. In response to the second part of the research question, it should be said that the way and reasons for the arrival of stained glass in Iran included several factors: imitation of the flat glass windows of contemporary churches in the West with the stained glass method invented by the Romans; the attention of the Safavid kings, including Shah Abbas, to this art; making mosque lights and installing colored glass on doors and windows; the use of mirror work, especially uniform mirror in harems, followed by the use of mirror work in religious buildings such as imamzadehs in the Qajar period. The expansion of political relations with the West and the arrival of Venetian glassmakers in Iran also boosted this industry. The stagnation and incapability of manual glass workshops to meet the needs of the society in the Qajar period and its concurrency with the industrial revolution along with the increasing expansion of foreign relations with European countries, the importation of this product from other countries such as Russia, England, France, Germany, and India increased, as did the development of knotting and wooden doors and windows, which caused an increase in the flat colored glass in Iran.

Keywords: architecture, glass making, flat glass, colored glass, Iran.