

2D and 3D printing

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This research aims at developing technical concepts involving 2D and 3D printing on glass to be applied on art making.

3D printing

The main purpose of this research is the production of glass art involving 3D printing on glass. In a first approach we used Ferro glass frits that were already at VICARTE in a 3D printer and a binder that is commonly used in this equipment. This binder is essential to hold the glass powder together before sinterization. The first experiments were made using a recipe given by the Washington University that used mixture of glass powder with sugar and dextrin.¹

Before we could try the glass mixtures in the printer, the sinterization temperatures and glass transition temperatures had to be determined for each frit. The powder mixture was combined with the binder used in our equipment and shaped by hand into bars. These bars were tested at various times and temperatures to first burn out the organic compounds and then sintered until solid bars were obtained. Two different Ferro frits were used for the first experiments. Further characterization of the used frits is currently taking place at Penn State University.

After these tests the mixed powder (glass frit, dextrene and sugar) was used in the 3D printer and a few printing tests were made. When removed from the printer, the 3D models were very soft and fragile but after sinterization the first models were obtained (Figure 1). Future work will be directed to the composition of the mixture containing glass and also to the type of binder to be used.

Digitalization at 3D will be used for models reproduction made by artists, for further reproduction in glass by pâte de verre or kiln casting techniques.

Another type of 3D printing is being explored using a laser to obtain luminescent images inside the objects. Creation of artworks directly on a computer using adequate 3D software will allow direct reproduction of the virtual models in the 3D printer.

This work gave rise to a research project with a student from Penn State:

Rachel Guarriello, Summer 2013 IMI for glass Research Overview, Penn State and VICARTE, 2013.



Figure 1 – Sintered 3D models printed in a 3D printer using a mixed powder containing glass frit, dextrene and sugar.

2D printing

2D print was successful used in 2D printing by CO₂ laser engraving in float glass painted with different enamels and some artworks were made and showed in exhibitions. Some examples are showed below (Figure 3). This work was supported by a FCT project. The future work will be to explore the potentialities of this technique using different glass compositions.



(a)



(b)

Figure 2 – Artworks by Robert Wiley: (a) Skull, laser engraving and painting, (b) Portrait, laser engraving and painting.

Oral Communications

- R. Wiley, "Recent Developments with CO₂ Laser Engraving and Enamel painting for the Artist", Glassac: Glass Science in Art and Conservation, Bronnbach Monastery, 10th-12th May Germany, 2011.

Exhibitions

- "Infusão" from Robert Wiley, Solar Dos Zagallos, Câmara Municipal de Almada, Sobreda, Portugal, 2012

- "D'ArteQuímica" from Robert Wiley, Biblioteca de Faculdade de Ciências e Tecnologia Universidade Nova de Lisboa, Monte de Caparica, Portugal, 2011.

- "GLASSARTE" from Robert Wiley, IMARGEM, Associação dos Artistas Plásticos do Concelho de Almada, Portugal, 2011.

References

¹ "Recipes" *Open3DP (Open 3D Printing) RSS*. Washington University, available at <http://open3dp.me.washington.edu/>, on 01 Aug. 2013.