

2nd year ENSCL

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SUBJECT N° 2

Contact: Nathalie TANCRET (nathalie.tancret@ensc-lille.fr)

Glass corrosion

1 – Definition

In a scientific way, the glass is defined as an amorphous material (*i. e.* non-crystallized) having the glass transition phenomenon. Below this very high transition temperature, the glass is the glassy state [1][2]. Most often, the glass is made of silicon oxide (silica SiO_2) and fluxes (network modifiers). A glass may include a wide variety of chemical elements and present very complex compositions that vary according to the use made of [3].

2 – Uses

Glass is mainly used in optical refractive properties and transparency. It is also used in chemistry and in the food industry: it reacts very little with most of the compounds used in these areas, and it is therefore an ideal material for containers (bottles, yoghurt pots, beakers, Erlenmeyer flasks, column distillation, test tubes, etc.). One of the only liquids having the power to dissolve the glass is hydrofluoric acid (HF). Nuclear waste with high activity can be confined in glass by the process of vitrification.

Glass is also a building material, very important in modern architecture and the automotive industry. It can be found in the form of microspheres, fibers, mats or fabrics. Incorporated into the polymer matrix or deposited on the surface, these presentations are used in particular as reinforcement of thermoplastic (polyamides...) or thermosetting (polyester, epoxy ...) resins, in plastics, as well as in composite materials.

3 – Corrosion of glasses [4][5][6]

Everyone is faced with the corrosion of glass in household ([7][8]) but the problems of corrosion of glasses may be of different nature and very varied [9]. Corrosion can occur in several ways: by radiation, chemical pollutants, microorganisms, vibration, rain, hail, ... this can be manifested by a loss of transparency, corrosion crusts, change color, iridescent, holes, etc ... The extent of corrosion is due to the chemical nature of the glass but also to the surface condition of the glass and internal tensions. The consequences of corrosion can be more

severe depending on the uses of glasses affected by this phenomenon: glass for medical use or glass for confinement of radioactive waste for example.

4 – Study

Starting with a general search, you will make a more precise idea of the topic. Look for a definition of words you do not understand. **You will have to limit you in your subject of particular interest to one of its aspects, which you choose, this project is yours.**

The literature search will be focused on:

- Definition and chemical composition of glasses

- Different uses of glass

- The different types of corrosion depending on the nature of glass and the nature of the corroding factor

- The synthetic and attack routes of these materials

- Possible studies to be made (chemical and physical)

- Etc.

5 – References

- [1] <http://fr.wikipedia.org/wiki/Verre> (21/07/2009)
- [2] <http://en.wikipedia.org/wiki/Glass> (27/07/2009)
- [3] Course « céramiques et verres », Nathalie Tancret, ENSCL, 2nd year, S7-S8, 2009-2010
- [4] http://www.conservation-science.ch/files/verres_sw.pdf (21/07/2009)
- [5] <http://www.ambafrance-uk.org/Le-bois-des-vitrines-des-musees.html> (21/07/2009)
- [6] <http://cat.inist.fr/?aModele=afficheN&cpsidt=8556237> (21/07/2009)
- [7] <http://www.cadeaux.com/v4/forums/forums-familiaux-recuperer-des-verres-t902806.html> (21/07/2009)
- [8] Examination ENSCL 2nd year, « céramiques et verres », Nathalie Tancret, 8th January 2007, exercise III
- [9] <http://www.international.icomos.org/publications/93stain17.pdf> (21/07/2009)