

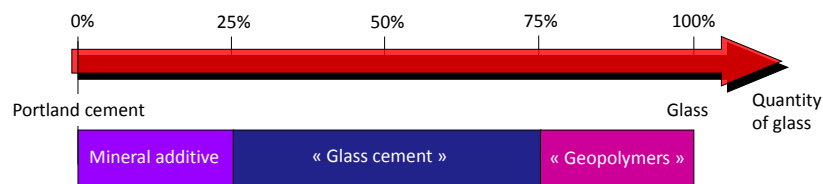
Recycled glass in civil engineering applications: a high added value material

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Glass is a common product that can be found in different forms: bottles, jars, windows and windshields, bulbs, cathode ray tubes, etc. These products have a limited lifetime and must be recycled in order to avoid environmental problems related to their stockpiling or landfilling. Several recycling channels already exist for glass recovery, the main one being the manufacture of new glass products. This operation is usually feasible when the glass is recovered as separate colours to produce glass products of the same colour. However, most of the time, the collected glass is mixed and so unusable for the production of bottles of a given colour. Consequently, secondary uses for recycled glass have been developed such as abrasive, glass wool or water filtration media. Another important channel for the recycling of mixed glass is construction materials.

Civil engineering offers varied and interesting opportunities for these glasses, since they have properties suitable for most of the applications related to construction materials. The main highly valued property is the reactivity in basic environment facilitated by the amorphous structure of the glass. The aim of this presentation is to show a few examples where glass found a second life and became a material of choice having a high added value.



The presentation is structured in three parts:

- 1- The use of powdered glass as supplementary cementing materials (mineral additive) in Portland cement-based applications (usually less than 25%). This part is focused on the duality of the glass behavior: fine particles of glass usually present pozzolanic activity beneficial to the concrete, while coarse particles are usually deleterious to concrete due to alkali-silica reaction (ASR).
- 2- The manufacture of glass cement made of binary, ternary or quaternary binders. These cements have a low kinetics of reaction and are often used in public works (such as pavements). They sometimes have a self-healing behavior.
- 3- The synthesis of geopolymers, by the alkaline activation of the glass. These materials often not contain any Portland cement and can represent alternative low-CO₂ binders in specific applications.