
EcoGlassFab : Eco-Glass-Fabrication from the assembly of secondary precursors

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Abstract

A calculation tool to formulate Eco-designed glasses is being developed within the Institute of Sciences and Technologies for a Circular Economy of Low Carbon Energies. The objective is to develop an "EcoGlassFab" application that will allow the calculation of the best available secondary materials assemblies (bio-sourced materials, specific cullet, PV glass, industrial mineral materials to be valorized, fumes, dusts) and to elaborate glasses considering the compositions and technical specifications of glass manufacturers. In addition to the scientific and technical challenges (reactivity at high temperature, optimal thermal flows and glass quality), this tool will take into account economic and environmental aspects through a systemic approach. Its development was initiated by a Life Cycle Analysis as well as a technical-economic analysis based on a given glass formulation with low impurity tolerance. The scope of the study extended from the extraction of raw materials in the mine to the production of the glass at the end of the glass furnace. Data from the so-called "conventional" process, which includes 100% primary raw materials, and the "EcoGlassFab" process, which includes a proportion of secondary precursors to replace certain raw materials, were compared. The results show that the substitution of raw materials by secondary materials in the selected case study allows to reduce the environmental impacts by about -15%, on all the 16 classes of the life cycle analysis, considering a substitution of raw material of 25%. This study must be completed by chemical reactivity studies as well as heat flow measurements to determine the technological feasibility of this type of Eco-designed glass. This approach will be transposed to many glass compositions for various applications (flat glass, hollow glass, glass fiber, glass frit, colored glass,...).

Keywords: Calculation tool, glass formulation, secondary raw materials

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