EFFICIENT RECYCLING OF POLYVINYL BUTYRAL FROM LAMINATED GLASS CONSTRUCTION WASTES IN BATTERY APPLICATIONS IN A CIRCULAR ECONOMY APPROACH

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Laminated glass is obtained by bonding glass layers with a polymeric interlayer. Polyvinyl Butyral (PVB) is used as interlayer in laminated glass and its use in construction components is growing, therefore the proper recycling/reuse at the end-of-life is increasingly demanded. In EU, glass waste from Renovation and Demolition are quantified on >1.5 Mtons/year. The proper recycling of all building glass waste could avoid 925.000 tons of landfilled waste every year. Up to now, most of the post-consume PVB material in laminated glass is incinerated/landfilled, and only a 9 % is recycled in secondary uses. Recycling of PVB presents several issues related with the contents of glass, humidity, mixing of compositions and polymer optical degradation, which prevent its easy reuse as interlayer.
In this scenario, the newly funded SUNRISE European project aims at developing an innovative optical multi-sensor sorting tool based on industrial in-line techniques (Raman, IRS, Fluorescence and Optical Spectroscopy) and AI algorithms, which will allow optimal classification of laminated glass according to composition and degradation. Therefore, the purified high-quality PVB resulting from the mechano-chemical treatment will be reused in its primary application as interlayer film in laminated glass, while the low-quality recycled PVB will be repurposed in different applications. In order to ensure the success, the project counts with glass recycling associations and companies and main actors in mechano-chemical treatment of PVB and optical in-line systems. Industrials partners will validate the suitability of the final products in a market environment. Other transdisciplinary aspects will be incorporated including modelling, health, safety and environmental issues, dissemination/exploitation, and standardisation. The success of SUNRISE will increase the European market in 360 million €/year by the proper collection and recycling of >1.2 Mtons/year of laminated glass, which will avoid PVB wastes of more than 125.000 tons, representing benefits at economic, environmental, and social level.
In the framework of the SUNRISE Project, the goal of our group is to exploit new strategies for the re-use in energy storage application of the fraction of PVB, which does not fulfill the requirements for the re-integration in the original glass manufacturing process. Particularly, the recycled PVB will be used as a binder in the electrode preparation and/or as a separator in lithium or sodium ion batteries through green chemistry approaches (up to transform it into a polymeric electrolyte membrane for potential development of solid-state batteries).

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