AZ 2.2 RECOVERY AND RECYCLING OF PLASTERBOARD IN THE BUILDING INDUSTRY

Drywall is one of the most used materials in construction, thanks to its easy application and its multiple properties (thermoacoustic, fire-retardant, water-repellent). It is composed of 93% calcium sulphate dihydrate and the remaining 7% paper.

This material exists commercially in different forms and its composition varies accordingly:

1. "Standard" plasterboard: consisting of a plasterboard plate resting on a layer of cardboard.
2. Plasterboard with Fiberglass: consisting of a plaster plate resting on a glass fibre fabric.
3. Fire-fighting plasterboard or "Reinforced": consisting of a sheet of "reinforced" plasterboard with various minerals and additives.
4. Acoustic or Thermal Insulating plasterboard: the plaster is coupled to a material that gives it certain characteristics, for example, the glass wool makes it sound insulating while the polyurethane makes it thermosetting.

SARR project AZ 2.2 aims to identify a methodology for the recovery of gypsum plaster, also allowing its reuse to give fresh plasterboard, following the circular economy principles. Despite its nature, a good recovery and recycling of drywall allows a significant environmental advantage. Drywall consists of 93% calcium sulfate dihydrate ($CaSO_4$ $2H_2O$). This prevalence of sulfates causes the production of H_2SO_4 (very strong, corrosive mineral acid, with a bad smell and toxic) in case the gypsum is wet, while sulfur dioxide (SO_2) is produced (corrosive gas and acute toxicity) in case the gypsum is burned.

From a careful assessment of the most common practices, it has been observed that waste from construction processes is the best for the recycling process as it does not contain contaminants. From this type of waste it was therefore possible to confirm that the quality of recovered and recycled gypsum is comparable to quarry gypsum and therefore reusable for the production of new gypsum. One of the main problems with this type of recovery concerns the profit and loss account. Since these are low value-added products, the impact of the cost of recovery, separation and recycling is so high as to discourage this type of supply chain. In this work we want to overcome this criticality by giving to the finished products (plaster and plasterboard) implemented properties compared to quarry plaster, such as antimicrobial characteristics, antifungal, photocatalytic to purify/de-pollute the surrounding air.

Waste resulting from demolition and renovation processes may contain contaminants and, consequently, make this type of plasterboard less suitable for the recycling process. In fact, the probability of finding dangerous materials (as asbestos, lead) in this type of plasterboard is high, forcing them to be landfilled. In order to recover the waste plasterboard to eventually obtain a new product for the construction industry it is necessary to

characterize the recovered plasterboard and distinguish the various types to select the most promising for the re-using process.

In the first stage of the SARR project AZ 2.2, three plasterboard samples have been characterized after pulverizing the plaster. The best type of plaster selected for valorisation tests is the "Standard" plasterboard because it is the easiest to pulverize and has a pure plaster structure.

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