

## IMPROVEMENT OF BEHAVIOR AGAINST FIRE OF PLASTIC WASTE ADDED IN PLASTER PANELS

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**Keywords:** *Physical barrier; incombustibility; plaster compounds; plastics and fire, combustion gases*

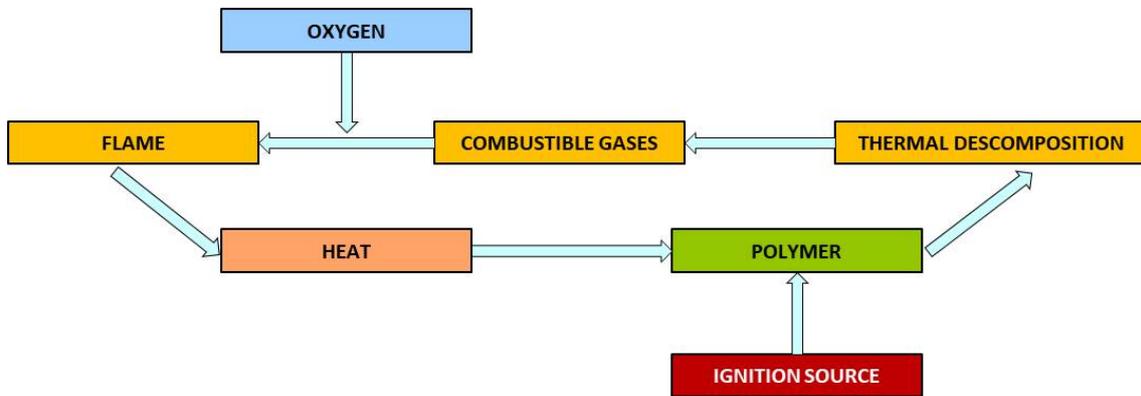
In the field of construction materials, the requirement of Fire Resistance tries to reduce the chances of an uncontrolled fire starting or spreading. This not only affects the danger involved in the destruction of the element of which the construction material is part, but also the risk that arises from the production of flue gases during the fire.

When fighting a fire, two basic strategies can be used: the disappearance of the fire once it started and the prevention through the protection of materials [1]. While for the first one there are the specialized professionals, firefighters, the innovation in materials can contribute to the second strategy.

Consequently, alternatives trying to change the behaviour of the materials during a fire are sought, either by modifying their composition, properties or

characteristics, either by providing a physical barrier that prevents the first element exposed to the source of ignition from being inflamed.

Plastics are composed of a series of organic monomers giving off CO<sub>2</sub>, water and other combustion products during a fire.



*Fig. 1: Scheme of the combustion cycle of a polymer [1]*

To verify the real effect of fire on drywall with plastic waste added, a real test was carried out with direct fire in the Fire Station of the Community of Madrid located in Collado Villalba. For this, a fire load during 30 minutes was used, according to ISO 834 [2].

Then, following the indications of the investigation by Serrano [3], specimens were made as panels that were transferred to the test site. Temperature was measured at 3 points of each specimen for 30 minutes every 5 minutes using a Testo 845 model laser temperature reader.



*Fig. 2: Gypsum panels added with plastic waste during direct fire test (left) and after test (right)*

The calculation of CO<sub>2</sub> and CO emitted during the combustion of plastic waste was obtained by the thermogravimetric analysis in air atmosphere and by elemental analysis [4].

This study proves that the incombustibility of the plaster contributes to the improvement of the behavior of the plastic waste in a fire, providing it, for a time, a physical mechanism of protection.

During a fire, the concentration of CO<sub>2</sub> generated by gypsum panels with plastic waste added, assuming complete combustion, would not exceed the amount considered as a risk to people's health. The calculated CO values were very

high but other factors such as the total amount of synthetic materials inside the rooms must be taken into account [5]. These synthetic materials would emit CO before the panels with plastic waste, whose emissions would be delayed by the physical barrier of the plaster.

## REFERENCES

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