

PROJECT PUBLISHABLE SUMMARY

Grant Agreement number: 243556

Project acronym: INTIMIRE

Project title: INTUMESCENT MATERIALS WITH IMPROVED FIRE RETARDANT AND FLAME RESISTANT PROPERTIES FOR BUILDING and TRANSPORT

Funding Scheme: Research for SME associations

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The objectives of Intimire are connected with the evolution in the strict CE regulation and standard for fire retardant products:

- the regulations for materials used in railway transport: ST EN 45545
- the novel standards of upholstered furniture: norm NF D 60013
- the evolution of the automotive fire test standard FMVSS 302.

The present approaches in developing flame retardant upholstery fabrics is be no longer sufficient, when novel requirements need to be fulfilled such as:

- An exclusive use of fabrics with a low rate of heat release
- An avoidance of the use of fabrics that spread the fire to other elements with burning droplets.
- No release of toxic gaz.
- Limitation at the minimum rate the smoke (the opacity of smoke threaten lifes during evacuation in case of fire).
- A use of fabrics that are capable to prevent ignition of the underneath layers (foam, or stuffing) even at intense flames (e.g. in railway application against vandalism using flames).

The new material must have two main functions:

- Fire retardant properties: increase the ignition time (not easy to ignite the materials).
- Flame resistant properties: able to stop the propagation of flame, after ignition, and trap toxic gaz.

Currently, there is no textile product able in the same time, to achieve these two properties.

The working principle lies in that Expandable Graphite will expand under high temperature and become char barriers which could reduce the air fluid and resist the fire effectively. Furthermore, it will behave as active carbon to filter smoke when it is expanding.

For these reasons, Flame Retardant Expandable Graphite has not only good performance in fire resistance but also low smoke, no dripping and no damage to human body and environment. These features could meet the future fire resistance tendency.

The achievements of the project are:

- Development of nano graphite as fire retardant additives. These additives have been incorporated in the thermoplastic resin, or back coating resin. In case of fire, the formulation is able to develop a carbon char in order to protect no burnt materials.
- Development of RDT activities to optimize the fire retardant behaviour of polyester and polypropylene with formulation totally free of halogen. The behaviour of each formulation has been analyzed. The criteria of selection of formulation are based on the ignition time rate of heat release and quantity of smoke released during the combustion.
- The tests of spinability have been undertaken for the most performing formulation PET and PP. It is possible to produce multifilament PP on a semi-industrial scale with 10 Wt-10% of the retardant YA whatever the amount of fire retardant YA, a very small decrease in tenacity was noticed whereas the strain at the break decrease with increasing concentration. The fibres produced have developed a low volume of char. Some formulation based on additive YA and synergistic agents seem to give more encouraging results.
- Some additives are focused on the microencapsulation of FR additives. The microencapsulation of additives is a success. Multifilament yarns filled with the microcapsules containing FR were produced and mechanical properties were evaluated. All the formulations selected with the microcapsulated products failed for passing the DIN 4102 (vertical test). The protocol of washing microcapsules has an impact on the performance.
- Some RDT activities have been investigated with the hot melt process.
- In order to optimize the fire retardant behaviour of samples, a back coating able to produce carbon expandable char have been evaluated. The application of fire retardant back coating involves a decrease of heat release.

Association of SME's has organised dissemination and training session in order to identify the requirements for the transport market and invites their members to create a network with the Intimire consortium.

Formulations have been scales up to semi industrial scale. However, optimisation is still needed to perform an acceptable industrial production. The ultimate goal is to scale up the selected formulation at the semi-industrial scale and industrial scale. This type of fibres shoes does not exist on the market. The final intumescent structure based on blend of yarns (intumescent or not), or based on fire retardant coating should answer to the new requirements of norms for public places, transports (example: CEN 45-554 for railways applications).