

## **Abstract**

Façade fires are a big concern due to past incidents and the large number of victims encountered. Vertical flame spread mechanism specific to this type of fires is a complex phenomenon with parameters that are often difficult to be coupled. Moreover, the architectural design of the façade assemblies further complicates the evaluation of the fire safety strategies.

The energy reduction requirements have led to an increased use of combustible insulating materials. Polystyrene is one of the first synthetic polymers used on a large scale for thermal insulation of the buildings. Due to its remarkable properties like transparency, high chemical stability and dielectric qualities it is the most preferred material among plastics. Although, polystyrene is a combustible material, it is still used on the construction market due to its highly insulating properties. Often designers need to make a compromise in the early stage of the building to achieve a balance between fire safety strategies and the energy reduction requirements. Since these requirements are strongly interrelated there is a continuous need for further improvement of the construction materials used for facades.

The main goal of this thesis is to quantitatively evaluate the flammability properties of different polystyrene compounds and to investigate whether the addition of graphene in their composition could enhance these properties.

The experimental measurements using graphene PS masterbatch have shown important improvements in the fire properties of the polystyrene compound. The interaction between graphene and polystyrene matrix generates changes during the chemical reaction of this thermoplastic material.