

The exposure of steel structural members to high temperatures reduces their strength and rigidity and may lead to structural collapse of the steel when the critical temperature of the structure is reached. Fire safety of steel structural members may be achieved by use of intumescent coatings.

Conventional intumescent coatings containing ammonium polyphosphate, pentaerythritol and melamine have good expanding effects and fire-retardant properties, so they are widely used to provide fire protection for steel structural members. However, they suffer from diverse technical limitations such as poor behaviour in some weathering conditions, poor in-can stability and some difficulties in their application.

This project aims at overcoming such limitations by the development of new intumescent coating systems based on nanoparticles (organic-inorganic hybrid systems) acting not only as fillers, but also as functional and active intumescent components. The use of such materials will result in the improvement of the following properties:

- Higher durability of the intumescent system by improving vapor and water barrier properties isolating the more permeable components, and diminishing leaching out of low molecular weight moisture sensitive elements.
- Improved mechanical characteristics by the replacement of the fibers introduced to reinforce char layers by the nanocomposite structures.
- Increased thermal insulation enhancing protection of the underlying substrate in a effective way by improved charring and condensed phase mechanisms for flame retardancy.
- Lower smoke toxicity taking advantage of the structures of nanocomposites and their related gas barrier properties acting as smoke suppressants.