Comparison between one step and multistep fire retardant coating processes by Life Cycle Assessment
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Introduction

The design of a functional coating on a substrate usually requires different layers, each of them having a specific role. So, the development of innovative coatings with multifunctional properties is very challenging. Self-stratification can be an alternative as it is an eco-efficient process allowing the formation, in only one application, of a multi-layer film.

Coating properties

The reference system (REF) is made of two distinct layers: epoxy resin as bottom layer and silicon resin as upper layer. In the self-stratifying coating (AS), silicone and iron oxide migrate to the upper layer (Figure 2).

The samples were tested to a fire test UL-94 (Figure 3), it evaluate the tendency of a material to extinguish or to spread the flame after ignition of a material. Other characteristics have been evaluated in order to compare both systems (Figure 4). The global performances of the AS system appear more interesting than those of the REF system.

Results of LCA

LCA was carried out on two lab scale coating processes. Functional unit (FU) : “Deposit on a 100cm² polycarbonate plate a coating allowing reaching a V0 rating at UL94”

Calculation method : Recipe E 1,12 (Europe)

Conclusion

The next step of this work is to carry out the same study on a flame retardant self-stratifying coating based on eco-friendly products (bio-based epoxy resin, green solvent …) to see the influence on the global environmental impact.