METAL REPLACEMENT WITH POLYMERS IN PROFESSIONAL FOOD PROCESSING APPLIANCES

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INTRODUCTION

Metal replacement is one of the most promising solutions in industrial appliances [1,2], both to save money, reduce weight and increase competitiveness on market. Polymers in cooking environments are risky materials if exposed to heat and fire, and flame retardant additives and fire behaviour are key points that has to be considered before replace metals and in general in initial materials selection during appliances project and production.

AIM

- Flame behaviours evaluation integrated in materials selection process
- Correlation between flammability classes and different fillers percentages
- Distinction of flame retardants and their mechanisms
- Preliminary evaluation of international standards requirements in final products

MATERIALS AND METHODS

- Need of an alternative material to replace metal
- Component with known geometry (affinity selection [3])
- Performances required from the target function of the component: translation into quantitative constraints
- Screening of candidate materials (using suitable software packages or material libraries)
- International standards analysis and translation (e.g. EN 60335-1:2013-05 for professional food processing appliances)
- Identification of possible fillers/composites to obtain a specific flammability class (*Figure 3*)

STRUCTURE AND DISCUSSION

1. Current solution *(Figure 2)*
- Unique "flame retardant" class (e.g. in CES Selector [4]) → Data clustering
- No comparison among different fillers

2. Future solution *(Figure 3)*
- Correlation among flame retardant fillers, with evaluation of their efficacy in different polymers
- Tests to determine effects of filler % on flammability class (for different preferred thickness values)

Figure 1

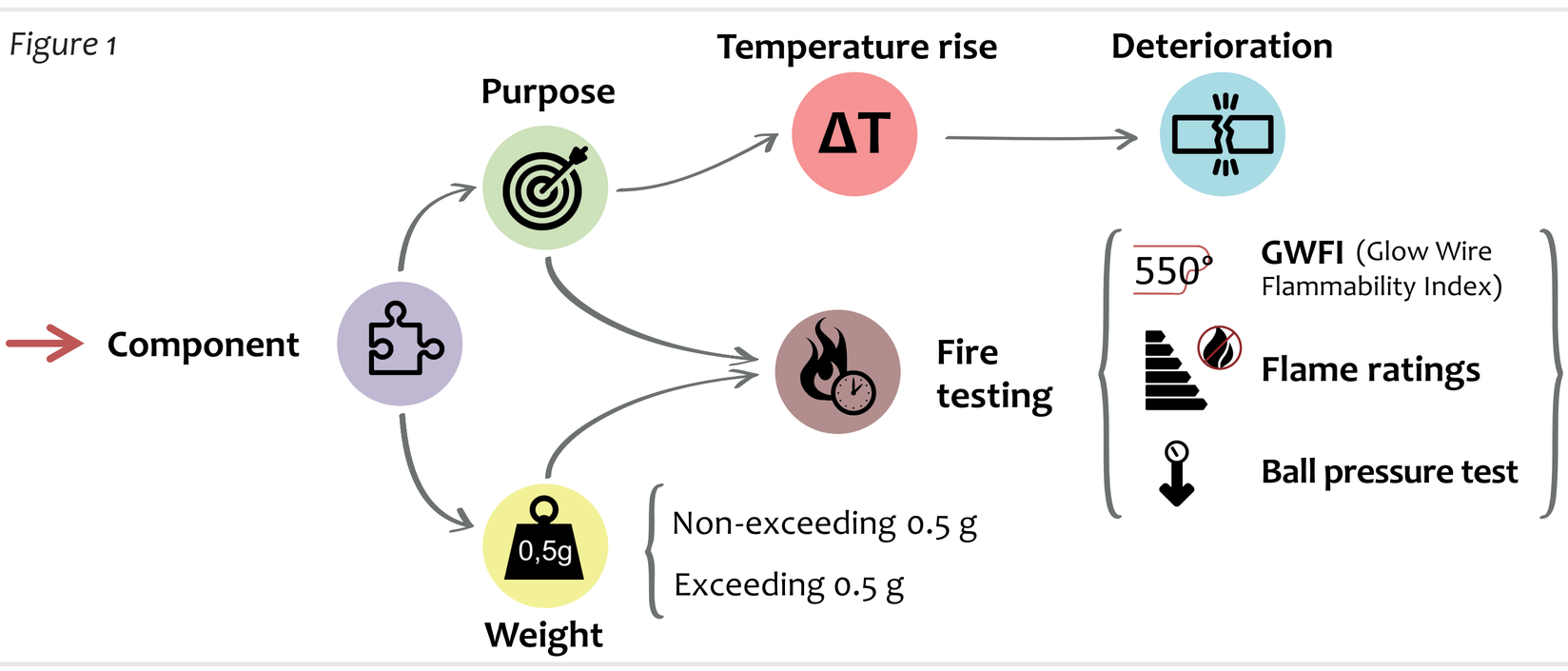


Figure 2

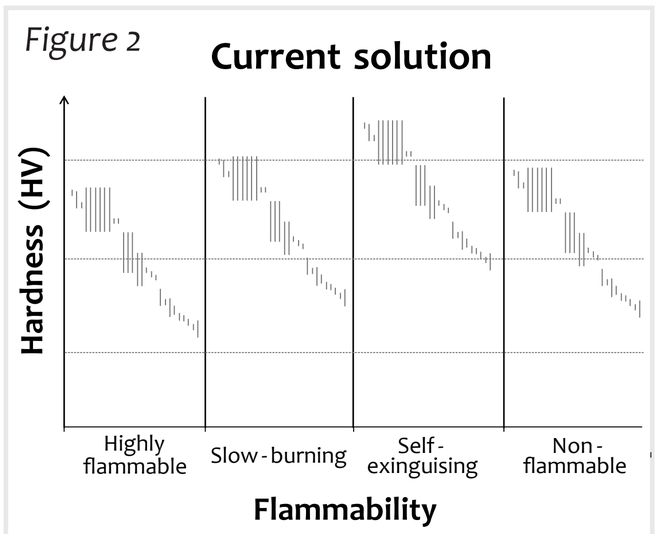
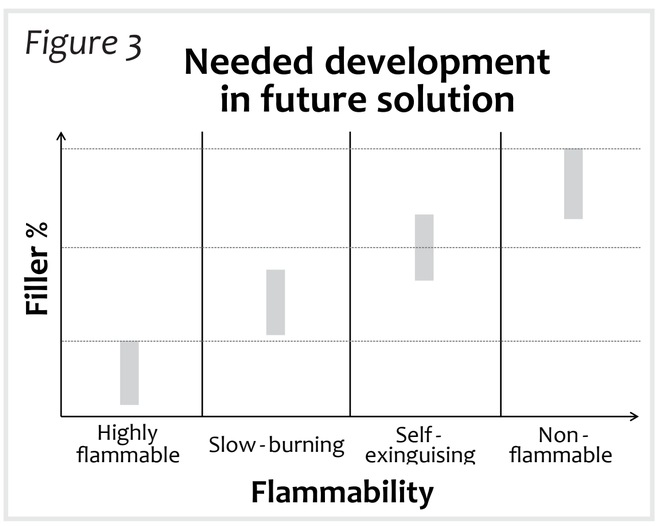


Figure 3



CONCLUSION

- Complex international standards for flame behavior testing of materials used in household and similar electrical appliances (e.g. EN 60335-1:2013-05)

- Useful correlation among filler presence (in polymeric matrices) and flammability classes

- Possible integration in materials selection process

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