Oral (S16-097, Time: Tuesday 14:10, Room: Bruker AXS)

Fused Filament Fabrication (FFF) with PP-based composites: effect of fillers on thermal conductivity and flammability

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3D printing of polymeric materials is growing and increasingly used and among the most developed techniques there is Fused filament fabrication (FFF). In recent years, researches have focused on adding polypropylene (PP), one of the most widely used polymers in the world, to the portfolio of materials that are currently FFF 3D printable. Furthermore, the applications of objects produced with FFF technology must be functional and no longer limited to the simple aesthetic function. Therefore, the goal of this work is to 3D print with FFF technique PP-based composites containing both additives with flame retardant and thermal conductivity properties. Initially, samples for fire resistance tests and for thermal conductivity tests were 3D printed using FFF technique and compression moulded using commercial filaments based on ABS, for flammability, and PLA, for conductivity. In this way the printing parameters were optimized to obtain comparable results between the two techniques. Subsequently, PP-based composites were then produced by melt compounding in a corotating twin-screw extruder adding boron nitride and nanoclay. Rheological characterizations were carried out on the composites in order to verify their 3D printability. The suitable filaments (constant diameter, circularity and low roughness) to feed the 3D printer were made with PP-based composites and then samples for fire resistance tests and for thermal conductivity tests were 3D printed using FFF. For comparison, tests were also carried out on the compression moulded counterparts. The objective is therefore to verify the functionality of the fillers in the composites compared to PP, both in the compression moulded and in the FFF 3D printed samples, to assess whether the different internal structure of the samples affects the flammability and thermal conductivity.