Recycling and valorisation of plastic Waste from Electric and Electronic equipment (WEEE)

Louis CHARTON , Mohamed YOUSFI, Abderrahim MAAZOUZ, Khalid LAMNAWAR*

Université de Lyon, INSA Lyon, CNRS, UMR 5223, Ingénierie des Matériaux Polymères, F-69621 Villeurbanne, France

* khalid.lamnawar@insa-lyon.fr

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Résumé:
The management of plastic waste from Waste Electrical and Electronic Equipment (WEEE) poses significant environmental challenges, particularly due to the complexity and contamination of polymers such as polystyrene (PS) and acrylonitrile-butadiene-styrene (ABS). This work proposes a novel recycling process of free flame-retardant recycled materials by creating multilayer coextrusion filaments to integrate these materials into a high-value recycling process, such as 3D printing. Targeted compatibilisation approaches are combined with multilayer architecture design to control the mass transfer of small additives or contaminants migration via selective localisation and process homogenization. By producing stratified architectures, we exploit confinement and chain-orientation effects to restore or improve stiffness, toughness and thermal performance. The approach combines microstructural characterisation (SEM/TEM, morphology analysis), thermal and mechanical testing (DSC, ATG, tensile and impact) and evaluation of behaviour during post-processing (3D printing, injection moulding). In addition, we perform a direct comparison between multilayer co-extruded filaments and filaments produced by conventional twin-screw extrusion from the same WEEE materials, to quantify how architectural processing affects morphology, properties and performance. The results demonstrate that process-designed multilayer architectures can substantially improve material performance and limit additive/contaminants migration, opening a scalable route to convert mixed WEEE streams into functional, higher-value recycled products.

Références :

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