

Valorization of plastic wastes for value-added applications

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The marine pollution of plastic wastes is one of the severe impacts of the human activities on the planet. Main treatments of plastic wastes include landfilling and incineration with or without energy recovery. A sustainable management is transforming such wastes into value-added products. This study aims to reinforce recycled plastics with unusable agricultural wastes so to meet requirements of added value use of recycled plastics. In this study, recycled polystyrene (R-PS) is reinforced with cottonseed hulls (CS-H). Grinded CS-H fillers were melting mixed with grinded polystyrene at filling contents of 10 %*wt*, 20 %*wt* and 30 %*wt*. The effect of CS-H fillers adding and their content on physical and mechanical properties of R-PS is determined using tensile test (ISO 527-2), low velocity impact tests (ISO 6603), FTIR spectroscopy, DSC and SEM analysis.
Up to 20 %*wt*, CS-H fillers adding improves the yield stress of R-PS by 40% (from 15 MPa to 22 MPa). Beyond 30 %*wt* content, the non-adhesion of fillers to the plastic acts likely as a high porosity and decreases the tensile resistance of R-PS. Regardless of the content of CS-H fillers, the addition of these increases the Young modulus of R-PS (from 1600 MPa up to 3600 MPa at 20% *wt* of CS-H content) and decreases it impact resistance by -20% (the peak impact force decreases from 1 KN to 0,8 KN and the absorbed energy from 2,72 J to 2,25 J).
Results showed that CS-H fillers adding not only increases the tensile resistance of R-PS but lowers the weight and the cost of recycled plastics to meet footprint requirements, thanks to the availability (in cotton producing countries), renewability, light weight and low cost of cottonseed hulls.
Keywords*: Recycled plastic, natural fibers, reinforcement, polystyrene*

Biography

Dr PADAYODI Essolé is Associate Professor at University of Technology of Belfort-Montbéliard (UTBM, France) and has his expertise in biosourced materials and passion in sustainable design. He is a header of the “Eco-materials” platform in the pole ERCOS of ELLIADD (EA. 4661, France) laboratory where he led technology research projects for developing sustainable and lightweighting materials for automotive companies.

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