When: 2019-09-04, 11:30 - 11:50, Where: A2. Materials for Green Economy

A2-WED-AM2-3 - Hydrophobicity of Polymeric Composites Reinforced with Natural Fibers into Polymeric Matrices: Polypropylene, Polyethylene and Polylactic acid

A2. Multifunctional Materials for Novel Applications

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Introduction/Purpose

The hydrophobicity of polymeric composites(PCs) manufactured with natural fibers(NFs) and Polymeric Matrices((PMs),Polypropylene(PP), Polyethylene (PE) and Polylactic acid(PLA)) was studied. Different weight fractions (WFs) of NFs (with or without NaOH treatment) coming from vegetable invasive species (see attached figure) as Ricinus Communis (T/Tt), Arundo Donax L. (C/Ct), Pennisetum Setaceum (R/Rt) and Agave Americana (P/Pt) located at Macaronesia (Canarias, Azores y Madeira) were added to the PMs. Mean values of the contact angles (CAs – without saturation in ultra-pure water (UPW), water contact angles (WCAs- with saturation in UPW) and water uptake (WU) of the PCs are presented herein. The obtained results are explained taking into account images obtained by Atomic Force Microscopy (AFM) and Scanning Electron Microscopy (SEM).

Methods

The NFs were incorporated into PMs with different WFs of 5, 10, 20, 30 and 40 wt.(%) and with size range of 2mm length. Two different manufacturing processes were employed: compression (CMP) and rotational molding (RMP). The variation of the surface wettability (assessed by measurement of CAs and WCAs) and WU (through swelling, mass loss (on drying) and mass gain (by saturation) were measured as in [1].

Results

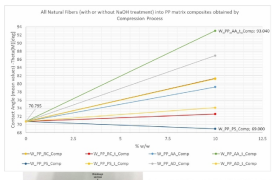
Comparatively to the neat PCs and among the different NFs loadings used, the highest positive and negative obtained variations (in terms of percentage) were +22% for CAs (C.PP.Pt) at 10 wt.(%), -37.5% for CAs (C.PE.Pt) at 40 wt.(%) and +24% for WCAs (W.C.PP.Pt) at 10 wt.(%), -29% for WCs (W.C.PLA.P) at 10 wt.(%) and +37.65% for WU (C.PLA.Pt) at 30wt.(%), -17.305% for WU (C.PLA.C) at 10 wt.(%).

Conclusions

Treated NFs offer positives effects on the hydrophobicity of the final PCs for a lower NFs content of 10 wt.(%). However, largest additions of NFs (e.g., 30 and 40 wt.(%)) have negative effects on the hydrophobicity and WU properties of final PCs.

Selected references

[1] M. E. Alemán-Domínguez, Z. Ortega, A. N. Benítez, G. Vilariño-Feltrer, J. A. Gómez-Tejedor, and A. Vallés-Lluch, "Tunability of polycaprolactone hydrophilicity by carboxymethyl cellulose loading," *J. Appl. Polym. Sci.*, vol. 135, no. 14, pp. 1–8, 2018.



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