The “green” challenge: PLA (nano)composites for "durable" applications?

Introduction

Polylactide (PLA) is currently receiving considerable attention for conventional utilization such as biodegradable packaging materials as well as production of textile fibers, and surprisingly enough, as (nano)composites for technical applications. For a great number of “durable” applications new customized PLA grades with improved properties are required. Like an expression of the high interest for PLA utilization in engineering applications, the aim of some R & D projects (e.g., NANOLAC – INTERREG IV) and of this communication, is to propose new PLA (nano)composites designed with desired end-use performances such as rigidity, improved tensile strength, or flame retardant properties.

PLA (nano)composites for technical applications

1. PLA + microfillers
   - CaSO₄ (anhydrite II) as microfiller
   - Potential utilization in electronic applications
   - Lactic acid (lactide)
   - Gypsum- (by-product)
   - Excellent filler dispersion
   - Impact or fire retardancy as tailored properties

2. PLA + nanofillers
   - PLA + Halloysite nanotubes (HNT), expanded graphite (EG), clays, carbon nanotubes (CNT),...
   - HIGH TENSILE STRENGTH:
     The best tensile properties (e.g. stress at break ~ 55 MPa) for PLA-40% All (silane) composites.

SPECIFIC FIRE PROPERTIES: PLA- (clays, CNTs, EG,...)

PLA microcomposites for “durable” utilization: addition into PLA of selected additives and CaSO₄ (All form), a by-product issued from lactic acid production process.
PLA-HNT nanocomposites: potentially interesting for mechanical applications as stronger, lighter and less expensive new materials.
Addition of carbon nanofillers into PLA is leading to nanocomposites very promising for utilization in engineering applications (multifunctional properties).

Conclusions & Acknowledgements

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