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PII: S0141-3910(16)30243-9

DOI: [10.1016/j.polymdegradstab.2016.08.005](https://doi.org/10.1016/j.polymdegradstab.2016.08.005)

Reference: PDST 8031

To appear in: *Polymer Degradation and Stability*

Received Date: 26 July 2016

Accepted Date: 11 August 2016

Please cite this article as: Amaro LP, Cicogna F, Passaglia E, Morici E, Oberhauser W, Al-Malaika S, Dintcheva NT, Coiai S, Thermo-oxidative stabilization of poly(lactic acid) with antioxidant intercalated layered double hydroxides, *Polymer Degradation and Stability* (2016), doi: [10.1016/j.polymdegradstab.2016.08.005](https://doi.org/10.1016/j.polymdegradstab.2016.08.005).

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## Thermo-oxidative stabilization of poly(lactic acid) with antioxidant intercalated layered double hydroxides

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### Abstract

Two antioxidant modified layered double hydroxides (AO-LDHs) were successfully prepared by the intercalation of 3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionic acid (IrganoxCOOH) and 6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid (Trolox) in the layered structure of LDH. It was found that by anchoring the phenolic moieties to the LDH layers the antioxidant power is retained in the case of Trolox, and even amplified in the case of IrganoxCOOH. A small amount of the two AO-LDHs was incorporated into poly(lactic acid), PLA, by solution mixing and melt extrusion. The thermo-oxidative stability of the composites was compared with that of the neat PLA and PLA containing free AOs. SEC analysis indicates that, after a controlled period of ageing, both the AO-LDHs protect the PLA from chain scission. The oxidation induction time (OIT, DSC) at 230 °C shows also the beneficial effects of the presence of the functional filler in the polymer matrix. Further, results from a preliminary migration test suggest that the AO species have a low tendency to migrate away from the AO-LDHs embedded in the polymer matrix thus keeping the AO protected inside the nanofiller layers thereby remaining active for a longer time.

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