

## Accepted Manuscript

Heat resistance, crystallization behavior, and mechanical properties of polylactide/nucleating agent composites

Lei Wang, Ya-nan Wang, Zhi-gang Huang, Yun-xuan Weng

PII: S0261-3069(14)00798-5

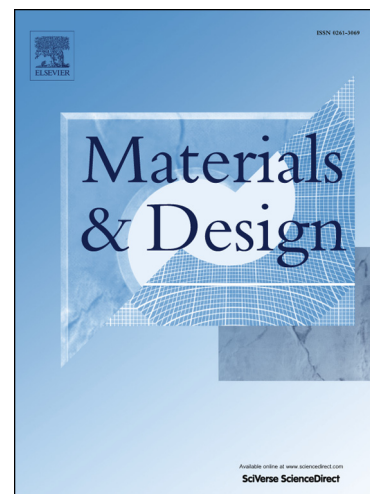
DOI: <http://dx.doi.org/10.1016/j.matdes.2014.10.011>

Reference: JMAD 6869

To appear in: *Materials and Design*

Received Date: 28 June 2014

Accepted Date: 5 October 2014



Please cite this article as: Wang, L., Wang, Y-n., Huang, Z-g., Weng, Y-x., Heat resistance, crystallization behavior, and mechanical properties of polylactide/nucleating agent composites, *Materials and Design* (2014), doi: <http://dx.doi.org/10.1016/j.matdes.2014.10.011>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Heat resistance, crystallization behavior, and mechanical properties of polylactide/nucleating agent composites

Lei Wang<sup>a</sup>, Ya-nan Wang<sup>a</sup>, Zhi-gang Huang<sup>a,b</sup>, Yun-xuan Weng<sup>\*a</sup>

<sup>a</sup> School of Materials and Mechanical Engineering of Beijing Technology & Business University,  
Beijing 100048, China

<sup>b</sup> China Center for Food Safety Research, BTBU, Beijing 100048, China

**Abstract:** The Vicat softening temperature, melt and crystallization behavior, as well as the mechanical properties of polylactic acid (PLA)/nucleating agent (TMC-328) composites with different TMC contents were investigated. PLA/TMC composites had a modulus–temperature curve characteristic of polymers in three phases, and these phases shifted with increasing TMC concentration. Non-isothermal differential scanning calorimetry was applied to investigate the heat resistance mechanism of PLA. The heat resistant temperature was positively correlated with the degree of crystallinity, crystallization rate constant, and cold crystallization rate constant. Moreover, the arrangement and movement of molecular chains influenced the heat resistance of PLA, with an increased rigid amorphous fraction improving the heat resistance between the glass transition and cold crystallization temperatures. In conclusion, addition of the nucleating agent enhanced the crystallizability of PLA, thereby improving the heat resistance of PLA. With 0.2% (wt/wt) TMC, the Vicat softening temperature reached 134°C, about 2.1 times that of the neat PLA (64.7°C). An increase in the dose of nucleating agent had little impact on the tensile strength of PLA/TMC composites, but the tensile elastic modulus was increased with a higher dose of nucleating agent, after an initial decrease.

**Keywords:** polylactic acid; nucleating agent; heterogeneous nucleation; crystallization; heat resistance.

Corresponding author: E-mail address: wyxuan@th.btbu.edu.cn, Tel.: +86-10-68985380,

Fax.:+86-10-68983573

Download English Version:

<https://daneshyari.com/en/article/10426476>

Download Persian Version:

<https://daneshyari.com/article/10426476>

[Daneshyari.com](https://daneshyari.com)