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High-performance biodegradable polylactide composites fabricated using a novel plasticizer and functionalized eggshell powder

Junjun Kong ^{a,b}, Yi Li ^a, Yungang Bai ^a, Zonglin Li ^{a,b}, Zengwen Cao ^{a,c}, Yancun Yu ^{a*}, Changyu Han ^{a*}, Lisong Dong ^a

^a *Key Laboratory of Polymer Ecomaterials, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, 5625 Renmin Street, Changchun 130022, China*

^b *University of Chinese Academy of Science, Beijing 10080, China*

^c *University of Science and Technology of China, Hefei, 230026, China*

* Corresponding Author: Changyu Han; E-mail: cyhan@ciac.ac.cn; Fax: +86-431-85262244.

Yancun Yu; E-mail: yuyc@ciac.ac.cn; Fax: +86-431-85262244.

ABSTRACT

A novel polyester poly(diethylene glycol succinate) (PDEGS) was synthesized and evaluated as a plasticizer for polylactide (PLA) in this study. Meanwhile, an effective sustainable filler, functionalized eggshell powder (FES) with a surface layer of calcium phenylphosphonate was also prepared. Then, PLA biocomposites were prepared from FES and PDEGS using a facile melt blending process. The addition of 15wt% PDEGS as plasticizer showed good miscibility with PLA macromolecules and increased the chain mobility of PLA. The crystallization kinetics of PLA composites revealed that the highly effective nucleating FES significantly improved the crystallization ability of PLA at both of non-isothermal and isothermal conditions. In addition, the effective plasticizer and well-dispersed FES increased the elongation at break from 6% of pure PLA to over 200% for all of the plasticized PLA composites.

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