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1 Improved Mechanical Properties of Polylactide Nanocomposites-
2 Reinforced with Cellulose Nanofibrils through Interfacial Engineering
3 via Amine-Functionalization

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13 **ABSTRACT**

14 One of the main factors responsible for the mechanical and physical properties of
15 nanocomposites is the effectiveness of the interfacial region to transfer loads and mechanical
16 vibrations between the nano-reinforcements and the matrix. Surface functionalization has been
17 the preferred approach to engineer the interfaces in polymer nanocomposites in order to
18 maximize their potential in structural and functional applications. In this study, amine-
19 functionalized cellulose nanofibrils (mCNF-G1) were synthesized via silylation of the hydroxyl
20 groups on the CNF surface using 3-aminopropyltrimethoxysilane (APTMS). To further increase
21 the amine density (mCNF-G2), dendritic polyamidoamine (PAMAM) was grafted onto mCNF-
22 G1 by the Michael addition of methacrylate onto mCNF-G1, followed by the transamidation of
23 the ester groups of methacrylate using ethylenediamine. Compared to native CNF-reinforced,
24 poly(L-lactide) (PLLA) nanocomposites, amine-functionalized CNF exhibited significantly

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