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Preparation of poly (propylene carbonate)/graphite nanoplates-spherical nanocrystal cellulose composite with improved glass transition temperature and electrical conductivity

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1 **Preparation of Poly (propylene carbonate)/Graphite Nanoplates-Spherical**
2 **Nanocrystal Cellulose Composite with Improved Glass Transition Temperature**
3 **and Electrical Conductivity**

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7 **Abstract**

8 Poly(propylene carbonate) (PPC) is a new attractive biodegradable polymers
9 synthesized from inexhaustible carbon dioxide and propylene epoxide, but shows low
10 glass transition temperature (T_g) and poor mechanical properties, which greatly limits
11 its practical applications and industrialization development. To improve T_g and the
12 practicability of PPC, in this work, graphite nanoplates-spherical nanocrystalline
13 cellulose (GNP-SNCC) hybrids, which were bonded by both physical and chemical
14 forces, were prepared by ball milling from graphite and microfibrillated cellulose, and
15 the structure formation as well as properties of PPC/GNP-SNCC composites were
16 studied. The results showed that the improved interfacial interactions between
17 GNP-SNCC and PPC, and the rigid two-dimensional structure of GNP-SNCC were
18 beneficial for the constraint of PPC molecular chains, thus significantly improving T_g
19 and the mechanical properties of PPC matrix, e.g. T_g increased from 34.0 °C of neat
20 PPC to 51.3 °C, and the yield strength increased from 27 MPa to 52.8 MPa. Moreover,
21 facilitated by SNCC, a conductive pathway of GNP was effectively constructed,

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