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# Biodegradable nanocomposite blown films based on PLA and PBAT containing silver-loaded kaolinite: Formulation and property testing for use as smart packaging for dried longan

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Novel biodegradable nanocomposite blown films based on compatibilized poly(lactic acid)-poly(butylene adipate-co-terephthalate) (PLA/PBAT) blends were fabricated for use as packaging for dried longan. Silver-loaded kaolinite (AgKT) dispersed in the polymer matrix as intercalated-exfoliated microdomains improved the properties of the films, in particular the moisture barrier properties. In addition, controlled silver release provided long-term antibacterial activity which can be attributed to AgKT's layered structure. The amount of released silver ions also complies with migration levels specified by the standard for food-contact plastic packaging. It was found that as little as 4 phr AgKT in the nanocomposites decreased the film's elongation at break from 213.0±5.85% to 53.8±1.81%, increased thermal stability for processing, and decreased the water vapor permeability by 41.85%. The shelf-life of dried longan as predicted experimentally by a moisture sorption isotherm and theoretically by the Peleg model were almost identical (~308 days) and were more than twice as long as for the films without AgKT under ambient conditions. Biodegradability testing for the whole life cycle was also carried out for the PLA/PBAT films both with and without AgKT and compared with PLA alone. The PLA film showed the highest rate of biodegradation followed by the PLA/PBAT blend and the PLA/PBAT/AgKT nanocomposite, respectively. Even though the presence of AgKT in the nanocomposite slowed down its rate of biodegradation, its % biodegradation of 69.94 % at the end of the test period (90 days) still conformed to the Chinese National Standard (GB/T 20197-2006) for a biodegradable plastic by being higher than 60 %. On the basis of these properties, the PLA/PBAT/AgKT nanocomposites are considered to be promising candidates for use in film packaging applications to replace non-biodegradable and petro-based plastics

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