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Morphology, thermal and dynamic mechanical properties of poly(lactic acid)/expandable graphite (PLA/EG) flame retardant composites

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ABSTRACT
This work reports on the effect of expandable graphite (EG) on the morphology, thermal and dynamic mechanical properties of flame retardant poly(lactic acid) (PLA)/EG composites. The composites were prepared by melt-mixing and their structure, morphology, melting and crystallization behaviour, as well as their dynamic mechanical properties, were investigated. It was found that graphite layers still existed in an aggregate structure with poor filler dispersion resulting in a lack of interfacial adhesion between EG and the PLA matrix. The presence of EG did not favour the crystallization of PLA, increased the glass transition temperature and showed a reduction in the crystallinity of the composites. The composites with higher filler contents showed enhanced storage and loss moduli. The glass transition temperatures from the loss modulus and damping factor curves varied inconsistently with EG content. The use of commercial EG as filler in PLA can preserve the thermal properties of injection moulding grade Cereplast PLA.