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PLA/GNP/NHA: Application of poly-lactic acid reinforced with graphene nano-platelets and nano-hydroxy apatite hybrids in load bearing bone implants

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The interaction of the materials used to design the scaffold with the biological tissues plays a vital role. Currently, biomaterials such as synthetic polymers i.e., poly-lactic acid (PLA) are actively investigated in bone tissue engineering due to their biocompatible, bio-resorbable and biodegradable nature. Furthermore, nano-hydroxyapatite (NHA) a bio-ceramic material that happens to be the major constituent of the inorganic segment of the bone has also attracted much attention due to its excellent biocompatible nature. In this study, 10-30wt% of NHA synthesized through precipitation method was used to reinforce PLA matrix via melt-mixing. With addition of 30 wt% of NHA, the thermal stability of the composite was seen to improve by 4%. However, PLA and NHA possess poor mechanical properties, limiting their application for load bearing bone implant. As a result, 0.01 g of graphene nano-platelets (GNP) dispersed in acetone was mixed with the synthesized NHA with the aid of ultra-sonication. The GNP/NHA hybrid was then used to reinforce the PLA through melt-mixing. From the field emission scanning electron microscopy (FESEM) images obtained, homogenous dispersion of GNP/NHA in the PLA matrix was observed. This in turn contributed to the increase in mechanical properties of the composite with addition of 30 wt% GNP/NHA by 11% and 9% compared to pure PLA and PLA/NHA composites.

Biography

Feven Mattews Michael is currently a PhD research student in Department of Chemical Engineering under Manufacturing and Industrial Processes Division at Nottingham University Malaysia Campus. Her research interests include tissue engineering, polymer nano-composites and nano-composites modified with radiation.

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