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Ageing behavior of Biodegradable Nanocomposites Material under the harsh Natural Weathering conditions of Saudi Arabia

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The degradation in biodegradable polymers are significantly affected by the change in the crystallinity with respect to time. Long time exposure in aggressive environment (either hot or cold climate) of any polymer material can cause changes in physical and mechanical properties, specifically color change, increase in brittleness. The objective of the present investigation is to understand the degradation of Poly(vinyl alcohol) (PVA)/Starch Blend (70:30 ratio) and its Nanocomposites with Graphene under the aggressive hot natural weathering conditions in Dhahran, of Saudi Arabia. PVA/Starch/Graphene nanocomposites were prepared via solution mixing and casting techniques. In the early stages of polymer exposure, the degradation happens primarily due to the dissolution of the amorphous phase, while in the later stages even the crystalline regions undergoes degradation. Changes in crystallinity, mechanical properties, molecular structure, and morphology of the nanocomposites during the aging period have been observed at different time intervals and inferred. The thermal and spectroscopic results demonstrated the dissolution of the amorphous phase during early stages of exposure followed by the deterioration of the crystalline phase in later stages. Morphological micrographs showed that the surface of the nanocomposites had fewer defects compared to the PVA/Starch blend. PVA/Starch/Graphene nanocomposites showed a remarkable retention in total crystallinity compared to the PVA/Starch blend during the aging period. The incorporation of graphene into the PVA/Starch blend made both the polymers less vulnerable to environmental degradation, and these nanocomposites could therefore be suitable as packaging films for use in outdoor applications.

Biography

Jobin Jose has completed his PhD from Indian Institute of Technology (IIT), Kharagpur, India. Also, he did two years postdoctoral program from Chonbuk National University, Jeonju, South Korea and another two years in the Department of Chemical Engineering, KFUPM, Dhahran, Saudi Arabia. Currently he is working as Research Scientist at the Research Institute in King Fahd University of Petroleum & Minerals, Saudi Arabia. His research interests include Polymer Nanocomposites, Polymer Recycling to make value added products, Protective Coatings, Water soluble polymers etc. He has published more than 25 papers in reputed journals and conferences. He has been serving as an editorial board member of repute.

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