Importantly, polylactic acid readily degrades when discarded in the environment into lactic acid, carbon dioxide, and water, all of which are essentially environmentally harmless.

Despite the many desirable physical properties exhibited by polylactic acid, its inherent brittleness and notch sensitivity pose a considerable scientific challenge and limit its large-scale application as a structural material.

Accordingly, there exists a need to develop methods for toughening polyester polymers, such as polylactic acid, which do not compromise the strength, stiffness, and transparency of the polymer.

Summary

The present disclosure relates to~~According to a first aspect, there is provided~~ a polymer comprising a polyester and at least one polyhedral oligomeric silsesquioxane, wherein the polyester is capable of forming a stereocomplex with a polymer comprising a complimentary polyester.

According to a first aspect, there is provided a polymer comprising a polyester block and a polyacrylate block, wherein the polyester block is capable of forming a stereocomplex with a polymer comprising a complimentary polyester, and wherein the polyacrylate block comprises at least one polyhedral oligomeric silsesquioxane.

According to a second aspect, there is provided a stereocomplex comprising at least one polymer as described in the first aspect above.

The present disclosure also provides~~According to a third aspect, there is provided~~ a composite comprising at least one polymer of the first aspect above and at least one matrix polymer.

According to a third aspect, there is provided a composite comprising a stereocomplex and at least one matrix polymer, wherein the stereocomplex comprises at least one polymer as defined above.

The polymers described herein are capable of forming stereocomplexes with polymers comprising complimentary polyesters. These stereocomplexes can be used to enhance the mechanical properties, the thermal resistance, and the hydrolysis resistance of polyester thermoplastic composites comprising them.

Advantageously, the polymers described herein can be used to improve the toughness of a matrix polymer, such