SUMMARY

Functionalised biochar for fire-retardant & bio-based composites

The recent interest in renewability and sustainability has urged the development of bio-based composite materials. Biocomposites have varied application potential that includes aeroplane and automotive parts, furniture, packaging, building materials, domestic appliances, etc. Therefore, the environmental compatibility of biocomposites has become an important consideration as a means to promote sustainability and curb pollution. Nevertheless, some inherent disadvantages hinder the widespread application of biocomposites. One of the biggest challenges with biocomposites is their susceptibility to fire and burning. Both the reinforcement and the polymer matrix are vulnerable to degradation by fire. This necessitates the development of treatments that would render the biocomposite constituents fire resistant.

Aims

The project is aimed at the development of novel biocomposite materials that are simultaneously fire retardant and mechanically strong. The proposed project would utilize the value-added material of biochar to host an effective fire retardant (FR) molecular component, for the manufacturing of biopolymer-based composites. The project is divided into four phases, wherein at the first phase the biochar would the doped with two FR systems. The second phase would involve the modification of two biopolymers by the selected FR system and selection of the most suitable polymer. In the third phase, the doped biochar and the most suitable biopolymer will be evaluated for the manufacturing of biocomposites. Finally, a heat-release kinetics model will be established for biocomposites during these three phases of research. The developed biocomposites would be a new class of materials that are concurrently sustainable while exhibiting superior performance properties. The creation of this bio-based material will pave the way for economic incentives through effective marketing.

Benefits of the project:

• Firstly, the project will utilise biochar in a new light (akin to a beneficial Trojan horse) to deliver FR in polymeric matrices.

• It will address the lowering of mechanical properties in polymers when FRs are added.

• From the technical point of view, the project will identify various factors that can be amalgamated to create a biocomposite that is concurrently fire-retardant and mechanically strong.

• Overall, the project will develop a holistic socio-technical view in highlighting the importance of sustainable, eco-friendly constituents that can be used to develop novel biocomposites.

Project information:

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