

Research Proposal

Research Title: "Preparation of Nanocomposites using nanofillers from Biochar and Studies on Their Mechanical Properties."

Executive summary

The present research work focuses on nanocomposites' preparation using nanofillers and the mechanical properties studies of different composites' combinations. Herein primarily we have to synthesize nanofillers from Biochar of different particle size and weight percentage. The developed nanofillers used for the making of different nanocomposites and explore to mechanical properties. Here to design and development a sustainable method for the preparation of nanocomposites from biochar.

Biochar is a stable carbon rich, charcoal like substance obtained from the biomass. Nano biochar composites material has gained increasing attention in recent years due to its unique mechanical properties and application. Various Biochar production method include slow and fast pyrolysis, Gasification, Torrefaction, hydrothermal carbonization, electro modification, Flash pyrolysis, vacuum pyrolysis, and microwave pyrolysis and so on.[1,2]

There are various biomass used for biochar production which includes agricultural residues, urban waste, paper waste, woody biomass, aquatic biomass, animal and human excreta, industrial waste, food and kitchen waste, dairy and paper mill waste, poultry waste, etc. Availability of the feedstock and the composition are the two important factors in the production of biochar.

Herein our research we are going to make use of cashew nut and Sugar cane char as our feed stock which will be subjected to pyrolysis process for the biochar production. In the pyrolysis process, thermochemical conversion of biomass is carried out in the absence of air and at a temperature $> 400\text{ }^{\circ}\text{C}$ to form a solid product known as biochar.[1,2]

Production of nanoparticles can be done either by a top down approach or by bottom up approach . Because of the high energy supply and costly precursors required for most of these processes herein our research we are planning to use the ball milling method in an effective way to produce nano particles from biochar. This method is

cost effective and best suited for the large scale production of carbonaceous nanoparticles.[3]

By using the nano particles produced, we aimed to produce eco friendly bio resin/biochar nanocomposite. In recent years composite materials became highly popular because of their newly find application in various field like automobile industry and microelectronics because of their greater strength to weight ratio and low cost.

Carbon-based nanofillers, such as carbon nanotubes (CNTs) and graphene sheets are considered as effective nano fillers due to their performance and structure .But because of their toxic nature when subjected to human inhalation is of huge concern[3] .Another disadvantage is their high cost and formation of agglomerates. Bio resin/biochar nanocomposite can be considered as a solution to the aforementioned issues. And in this research it is mainly focused to study the mechanical properties like tensile strength, Youngs modulus, resilience , tensile toughness of the fabricated composite material .[4]

References

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