A B S T R A C T

Natural fibres have so many advantages such as abundantly available, low weight, biodegradable, cheaper, renewable, low abrasive nature, interesting specific properties, as these are waste biomass and exhibit good mechanical properties. Natural fibres also have some disadvantages such as moisture absorption, quality variations, low thermal stability and poor compatibility with the hydrophobic polymer matrix. The surface of the fibre is required to chemically modify in order to remove or minimize the lignin content. Chemicals may activate hydroxyl groups or introduce new moieties that can effectively interlock with the matrix. Generally, chemical coupling agents are molecules possessing two functions. The first function is to react with hydroxyl groups of cellulose and the second is to react with functional groups of the matrix. There are many methods for study of compatibility of the liquid mixture.

In the present thesis, the compatibility of alcohol with blended chemicals for modification of natural fibres is studied, which may enable as potential filler for preparation of composites. The thesis is divided into nine chapters including introduction and complete review of related works. Chapter - I involved a general introduction and describes the fundamental of sound waves with special reference to ultrasonic waves. The natural fibres and their classification, structure, compositions and their different characteristics, advantages and disadvantages are sketched. Again the basic idea about the composite material and how they are obtained from the natural fibre are outlined. Chapter - II entails literature review, which highlights fundamental knowledge and the current developments of the work that is being investigated in this thesis. This chapter begins by outlining the main constituents of both conventional synthetic fibre and natural fibre composites. The structure and properties of natural fibres are highlighted. The studies of different acoustic parameter for related chemicals used in the work are studied and cover the scope and objective of the present work. This chapter provides a complete idea of the present work and application of the results for synthesis of the composite materials. This chapter also provides the lack in previous work and how it can be removed are discussed in a simpler way. The results obtained throughout the work are highlighted. This chapter provides a comparative study of the present work different from that of the previous work.
Chapter-III encloses the complete experimental procedure. This chapter explains the effects of chemical treatments on the fibre in terms of fibre constituents, structure, morphology and thermal properties. The results are characterized by scanning electron microscope (SEM) and Fourier transform infrared (FTIR) analysis. Chapter-IV, V, VI and VII establish the work carried out with different chemicals, which are compatible with different alcohols. Their blending with different alcohols is studied with the measurement of different acoustic parameters and their excess values. The variations of these acoustic parameters with frequencies provide more information about the surface treatment of natural fibres. The variation of different acoustic parameters is discussed in terms of intermolecular interactions exist between the compatible mixture like Acetone with methanol, ethanol, propanol and butanol, Maleic acid with methanol, ethanol, propanol and butanol, Acrylic acid with methanol, ethanol, propanol and butanol, Tartaric acid with methanol, ethanol, propanol and butanol. The variation of acoustic parameters with concentration of the base liquids and frequency provides more information about compatibility of the liquid mixture. Chapter-VIII involves the application of optimized blends for surface modification of date palm leave fibre, sisal fibre and flax fibre. The chemical interaction and morphological investigations are elaborated in this chapter.

Chapter-IX Summaries the entire results with conclusion along with future scope of the present work. The results obtained are categorically discussed the applications of the basic research to technology particularly for composite engineering and composites synthesis industries. This thesis may explore a new investigation during the selection of solvents for modification of different natural fibres. The selection of proper solvents or their blends for chemical modification may led to the removal of impurities including lignin from natural fibres by which fibres are suitable as filler in the preparation of composites.

Key Words: Ultrasonic velocity, density, isentropic compressibility, intermolecular free length, acoustic impedance, bulk modulus, solution blending, Compatibility, chemical modification, natural fibre, morphology, composites.
LIST OF PUBLICATIONS

Research Papers in International / National Referred Journals

Research publications related to the thesis work


Research publications beyond the thesis work

List of papers presented and published in conference proceedings


