Hindawi Publishing Corporation
Advances in Materials Science and Engineering
Volume 2016, Article ID 5954636, 10 pages
http://dx.doi.org/10.1155/2016/5954636

Research Article

Urea Formaldehyde Composites Reinforced with Sago Fibres Analysis by FTIR, TGA, and DSC

Tay Chen Chiang,[1] Sinin Hamdan,[1] and Mohd Shahril Osman[2]

[1] *Faculty of Engineering, Universiti Malaysia Sarawak, Jln Meranti, 94300 Kota Samarahan, Sarawak, Malaysia*
[2] *University College of Technology Sarawak, Persiaran Brooke, 96000 Sibu, Sarawak, Malaysia*

Correspondence should be addressed to Tay Chen Chiang; chenchiang@hotmail.my

Received 15 October 2015; Revised 1 December 2015; Accepted 7 December 2015

Academic Editor: Peter Majewski

Agricultural material or biomaterial plays an important role in the field of fibre-reinforced polymeric materials with their new range of applications and achieves the ecological objective. Composition and structure of the nature fibre and matrix must be taken into consideration for the end use. In this project, Sago fibre particleboard bonds with Urea Formaldehyde to form composite. Fourier Transform Infrared (FTIR) spectra are used to characterize the Sago/Urea Formaldehyde composite in terms of their functional group and bonding. Sago/UF composite with smaller particle and higher loading of fibre with 15 wt% of UF matrix has the higher curing properties. The composite will have a denser structure by adopting bigger particle and higher loading of UF matrix. The Sago/UF composite only endures a single stage of decomposition. Thermal stability results indicate that particle size, particle/matrix interface adhesion, and particle loading have great influence on the thermal properties of the composites.

1. Introduction

Sago palm is the primary source of Sago. Sarawak, Malaysia, is a state that produces the most Sago plant and is the world's biggest exporter for Sago starch. The demand for Sago is increasing from year to year and the Sago pith waste increases after starch process. It is estimated that approximately 7 tons of Sago pith waste is produced daily from a single starch processing mill [1]. Improper disposal of Sago waste will cause negative impacts to the environment. To avoid this environmental issue, Sago waste is mixed with Urea Formaldehyde through hot pressing process to produce a particleboard. The production of particleboards involves large amount of binders (Urea Formaldehyde) which accounts for up to 32% of manufacturing cost in the glue-wood composite industry [2]. Hence, Sago/UF particleboards have become the new composite material in reducing the demand in the furniture industries.

In general, composite materials are used in the industry due to their attractive characteristics such as optimized performance, minimized weight and volume, and cost saving as well as chemical and biodegradation resistance [3].

The final properties of a composite are influenced by the properties of the fibre and the interfacial bonding of fibre and matrix [4]. The chemical bonding plays an important role in the bonding process between the matrix and fibre in a composite [4]. Researchers have reported that the critical particles size, particle-matrix interface adhesion, and particles loading on composite have notable effects on the mechanical properties [5]. Although natural fibres are frequently used as reinforcement, there are some drawbacks, such as poor compatibility with thermoplastic matrix, high moisture absorption, high probability of deterioration by biological organisms, and low thermal stability [6]. A thermal analysis was performed on the Sago particleboard to qualify the gravimetric response and specific heat capacity at elevated temperature. TGA was used to analyze the thermal stability of materials through decomposition stage as well as under a variety of conditions and examine the kinetics of physicochemical processes occurring in the sample [7]. Temperature also influences