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INCORPORATION OF CYCLOTRIPHOSPHAZENES AS PENDANT GROUPS TO THE SAGO NETWORK

(Percantuman Siklofosfazena sebagai Kumpulan Terikat kepada Rantaian Sagu)

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Abstract

Cyclotriphosphazene-incorporated sago wastes as pendant groups have been prepared and structurally characterized using FT-IR and SEM. The chemically modified sago wastes composite was applied with binders and developed as sound absorbing panels. These panels are a class of organic-inorganic based materials that exhibit excellent fire retardant properties. Sound absorbance test has given a higher value at 250, 500 and 2000 Hz, which indicates the suitability of the panel for used in medium frequency. The panel was 51% lighter compared to fiberboard. The function and basic manufacturing of sound absorbers products was aligned with the present products in the market.

Keywords: sago waste, cyclotriphosphazene, fire retardant; sound absorber panel

Abstrak

Hampas sagu yang bergabung dengan kumpulan siklotrifosfazena telah disedia dan dicirikan dengan mengunakan FT-IR dan SEM. Komposit hampas sagu yang terubahsuai secara kimia telah campurkan dengan pelbagai bahan pengikat untuk dijadikan panel penjerap bunyi. Panel ini termasuk dalam kelas bahan organik-tak organik yang menunjukkan sifat kekalisan api yang baik. Ujian penjerapan bunyi memberi nilai tinggi pada 250, 500 dan 2000 Hz, yang merujuk kepada kesesuaian panel tersebut untuk digunakan dalam gelombang pertengahan. Panel yang terhasil adalah 51% lebih ringan daripada papan gentian. Fungsi dan pembuatan asas panel penjerap bunyi adalah setanding dengan produk terkini di pasaran.

Kata kunci: hampas sagu, siklotrifosfazen, kalis api, panel penjerap bunyi

Introduction

Sago palm is commonly found in tropical lowland forest and freshwater swamps. Sago palm is one of the main exports for Sarawak. Sarawak is currently the world largest exporter of sago products, exporting annually about 25,000 – 40,000 tons of sago products to various countries such as Singapore, Taiwan and Japan [1]. The mass production of sago produces residues during processing. It has been estimated approximately 7 t of sago pith waste was produced daily from a single sago starch processing mill [2].The residues were discharged into the river which eventually contributed to serious environmental problems. The fiber residue consists of lignin, cellulose and hemicelluloses which is vulnerable to form chemical bonding with electrophiles *via* hydroxyl groups.

Hexachlorocyclotriphosphazenes, on the other hands, is an inorganic compound with skeletal nitrogen and phosphorus atoms and susceptible to nucleophilic substitution reaction and exhibit unusual thermal properties such as fire retardancy. The incorporation of cyclotriphosphazenes as pendant groups to the backbone of synthetic organic polymers afforded a class of organic-inorganic polymers that exhibited useful thermal properties such as flame retardancy and self-extinguishability [3-6].