DEVELOPMENT OF WOOD WASTES AS FILLERS IN THE MANUFACTURE OF THERMOPLASTIC COMPOSITES

INSTITUTE OF RESEARCH, DEVELOPMENT AND COMMERCIALIZATION
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM, SELANGOR
MALAYSIA

PREPARED BY:

JAMALUDIN KASIM, AMRAN SHAFIE, SHAIKH ABDUL KARIM YAMANI

MARCH 2005

PENGHARGAAN

Setinggi-tinggi penghargaan dan ribuan terima kasih diucapkan kepada semua pihak yang terlibat secara langsung atau tidak langsung bagi membolehkan penyelidekan ini disiapkan dengan sempurna.

Diantaranya :

Encik Ismail Ramli
Penolong Pensyarah, Jabatan Teknologi Polimer
UiTM, Shah Alam

Encik Anuar Mohd Yaacob and En. Ahmad Sardey Bin Idris
Kakitangan Bengkel, Jabatan Industri Perkayuan
UiTM, Kampus Jengka

TABLE OF CONTENTS

Abstract

Industrial wood wastes used in the study were collected from the various wood industry namely; sawmill, furniture and particleboard industry in Pahang. The wastes was firstly dried in an oven, and then screened to remove the oversize materials. The study was conducted to analyze the effects of filler loading (10, 30 & 50%), maleated anhydride polypropylene (MAPP) addition (0 & 3%) and the waste sources. The polypropylene was first melted in a dispersion mixer followed by the addition of MAPP and sawdust. The admixture was then compounded using a mould into test samples. The samples was tested for mechanical and water absorption properties according to British Standard Methods BS 2782. Filler was found to significantly affect all the thermoplastic composite properties. Higher filler loading showed that all the strength properties decrease while their modulus increases, and water absorption properties decreases significantly. MAPP only affected the tensile strength and modulus and its elongation at break. Waste sources affected all the properties except for water absorption. All waste sources (except for waste from karas wood) are potential fillers for the manufacture of polypropylene composites. The thermoplastic admixture can be use as the starting raw material in the production of products that do not require higher strength properties.

1.0 INTRODUCTION

The plastics industry since it started has been compounding plastics with fillers for cost reduction. However in the 1970's rapid increases in resin prices caused many plastic formulators to investigate fillers principally to reduce raw material costs. With this research came a growing awareness that fillers beside cost reduction can in fact improve the performance of the final product. The key properties sought include fine particles and consistent particle size, good color, low hardness, low oil absorption and ability to improve bonding to the polymer (Eckert, 1999).

Since the early 90's, research and development are fast generating new technology for using lignocellulosic fibers blended with polyolefin plastics to produce an array of high-performance reinforced composite products. This development provides a strategy for producing advanced materials that take advantage of the enhanced properties of both lignocellulosic materials and plastics. These new composites give better benefits such as lightweight and improved acoustic, impact and heat reformability properties (Krzysik and Youngquist, 1991; Youngquist et al., 1993). A great variety of applications are then possible because of the many alternatives configurations of the products. Potential products include; storage bins, housing structures, furniture components, automobile components, wall panels, flooring materials and roofing system, and packaging applications (Youngquist et al., 1993).