OIL PALM FROND (OPF) OR COIR FIBER (CF): EFFECT OF PARTICLE SIZES ON THE TENSILE PROPERTIES AND MORPHOLOGY OF NATURAL FIBER REINFORCED HDPE.

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Abstract. *Oil palm fiber (OPF) and coir fiber (CF) were compared as the reinforcing agent in HDPE thermoplastic. Mechanical properties of OPF-HDPE and CF-HDPE are studied by investigating the tensile properties of the sample. Primarily, the samples were dried and blended by using Brabender Plasti-Corder at temperature 160°C and speed 45-50 rpm for 15 minutes. Tensile testing of the prepared samples was undertaken on Instron Model 5567 tensile machine. From the results, both samples showed that the modulus increases with decreasing particle size of the fiber. Although similar trend was observed , CF reinforced HDPE have higher tensile strength and elongation at break compared to OPF reinforced HDPE. The Young Modulus of CF-HDPE increase with addition of the CF but decrease with the increase in particle sizes. Whereas Young Modulus of the OPF-HDPE decrease with the addition of OPF and with the particle size increment. Morphology of the samples are investigated using Scanning Electron Microscopy (SEM). Fiber with large particle size interact poorly with the HDPE matrix probably due to the small surface area. Small surface area results in less interaction between surfaces. Failure occurs when CF and OPF were pull out and debonded from HDPE matrix and is shown by the presence of holes on the fracture surface left behind by the debonding of the fibers.*

Keywords: *coir fiber; oil palm frond; HDPE; tensile properties; SEM; stress; modulus young; strain; particle size*

1. Introduction

Combining agro-fibers (lignocellulosic) with other resources provides a strategy for producing advanced composite materials that take advantage of the properties of both types resources. The use of lignocellulosics as fillers and reinforcements in thermoplastics has been gaining acceptance in commodity plastics application in recent years. It allows the scientist to design materials bated on end-use requirements within a framework of cost, availability, recyclability, energy use, and environmental considerations. Lignocellulosic resources have low densities, are low in cost renewable, non-abrasive, have excellent specific mechanical properties, and are potentially outstanding reinforcing fillers in thermoplastic composites. In order to determine the appropriate type of fiber for long term composite performance, earlier studies had been conducted by researchers to look at the effect of particle sizes of some agro-fibers on the tensile properties and the morphology. This study is to compare the strength of oil palm frond (OPF) and coir fiber (CF) as the filler in the high density polyethylene (HDPE).

1.1 Oil palm frond (OPF)

Malaysia in particular, has a large quantity of biomass generated by oil-palm industries. Recent investigations have shown that valuable products could be produced from various biofibers of oil palm tree. Examples of such products are oil-palm component-plastic composites, oil palm component-rubber composites, sheet molding compounds, composites and pulp and paper. Since the chemical composition of oil palm is similar to that of timber, these wastes could be turned into new raw material with expanding potentials. For these purposes, the frond from the oil palm tree (OPF) had been chosen as the filler to