FLEXURAL PROPERTIES OF FLY ASH (0-80%) FILLED POLYPROPYLENE COMPOSITE

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INTRODUCTION

1.1 ABSTRACT

Fly ash (FA) as filler of base polymer matrices is has been used in order to cut the production cost of plastics products. It also improves the mechanical properties of the base polymer matrices. Polymer has very low stiffness, high wear rate and low hardness. This may cause the limitation of their usage in industry as final products. The purpose of this study is to determine the effect of fly ash as filler in flexural properties filled with Polypropylene (PP) composite. The concentration of fly ash was varied from 0 to 80% by weight. All the composites were prepared using twin screw extruder machine to form a fly ash and polypropylene composites. Then, test specimens were prepared using injection molding machine (IMM). A universal testing machine (UTM) will be used to conduct the flexural test. Thus, the flexural properties of fly ash and polypropylene composite were decreases as the concentration of filler increases. This may due to the agglomeration of particles at the higher concentration of filler and the particles also has lower chances to interact with the matrix due to the higher concentration of filler used.

1.2 BACKGROUND STUDY

Fly ash is a waste product that is produced in bulk density from coal fired thermal power plant. Fly ash consists of a mixture of solid and hollow spherical particles that are varying in size. The uses of fly ash as a filler in polymer composites has received a lot of attention recently due to the advantages of using the fly ash. For examples, it is a cheap material and always available (Sahai and Pawar, 2014).

Fly ash has been chosen as filler materials because of fly ash is obtained from coal fired power plants as a by-product of a burning process of coal (Sampathkumaran *et al.*, 2015). Cenosphere is one of the examples of fly ash. Basically, cenosphere is a solid spherical particle which consists of a small fraction of hollow microspheres (Chand *et al.*, 2010). Cenospheres have very low density which is lesser than 0.7 g/cm^3. They can be used as weight, shrinkage and warpage reduction and better surface finish also resistance for water absorption (Figovsky *et al.*, 1996).

The consumption of resin can be reduced by the use of cenosphere (Ramos *et al.*, 2005). Cenosphere also leads to cut the cost of products based on the polymers composites (Devi *et al*, 1998). However, the compatibility of fly ash cenosphere and polymer matrix is not easily to be blended due to the incompatibility surface chemistry of filler-polymer (Chand *et al.*, 2010).

Gumandi *et al.* had conducted the evaluation of flexural properties of fly ash filled polypropylene composites. It was found that the larger particle size of fly ash can decrease the rate of flexural strength while the smaller particles showed higher value of flexural strength. For the flexural modulus, it shows that the smaller filler loading increases and decreases of flexural modulus for larger filler loading. The amount of fly ash different sizes added to the polypropylene and the percentage elongation at break is also decreases on addition on filler. Therefore, fly ash added to the polypropylene can improve the flexural strength and flexural modulus, but dramatically decreases percentage elongation at break (Gummadi *et al.,* 2012).

Das and Satapathy (2011) have investigated the structural, thermal, mechanical and dynamic mechanical properties of cenosphere filled polypropylene composites. It was observed the addition of cenosphere to polypropylene has causes an increases in the flexural modulus due to the extent of cenosphere loading displays the effect of the inherent