UNIVERSITI TEKNOLOGI MARA

RHEOLOGICAL STUDIES OF ACRYLONITRILE BUTADIENE STYRENE (ABS) REINFORCED CARBON BLACK BLENDS

HARRIS SHAZLAN BIN MUHAMMAD SHAZWAN

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ABSTRACT

Nowadays, effort of combining conductive fillers into ABS making the blends antistatic has utilized plenty of potential applications with high demand on conductive polymer composite, which are not limited to electrical insulating materials any more. Carbon black (CB) is conductive fillers that can be added into ABS. The effects of added CB on the processability of Acrylonitrile–Butadiene–Styrene (ABS) thermoplastic polymers was investigated. The methodology for this experiment is divided by two steps. First, mixing of ABS and CB has been done by changing the weight percent which range from 10% to 50% using internal mixer with 210°C at a screw speed of 5 rpm for 3 minutes and later analysis the trends. Next step, rheological testing that have been done in order to measure the flow properties of composite materials have been evaluated by using Melt Flow Index. The rheological properties was calculated by result of Melt Flow Index. The processing flow decreases as the CB content increases. Next, the rheological properties of ABS reinforced CB blends has shown that flow rate in a polymer is related inversely to viscosity. High CB content in ABS will increases the resistance to flow. Thus reduces the flow rates.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

Acrylonitrile butadiene styrene (ABS) is common thermoplastic polymer whose commercialization began in the 1940's (Halonen, 2016). ABS is well-known in thermoplastic industries because it has good chemical and mechanical properties. One of the characteristics is smooth surface finish and good processing characteristics (Patiño-Soto, Sánchez-Valdes, & Ramos-deValle, 2007).

Filler is introduced because of the materials enhance the properties such as morphological, mechanical and others of the polymer blends. There is many available fillers such as carbon nanotubes (CNTs), graphene, CB, clay, Multi walled carbon nanotubes (MWCNT) and glass fibers are used as filler in small size which is nano size. The filler materials can improve mechanical, electrical and thermal properties of polymer composite. At the present time, for polymer matrix CB proves as practical filler material. Among other filler materials that available in market now, CB has lowest cost (Lohar & Jogi, 2018).

Nowadays, ABS is not limited to electrical insulating anymore but combining conductive fillers into ABS making the blends has utilized many potential of applications with increasing in demand on conductive polymer composite. Carbon fiber (CF), carbon nanotube (CNT) and CB are conductive fillers that can be added into ABS, despite the fact all the fillers that mention previously are good conductor, but have several drawbacks. For instance, CNT is ideal for conducting electricity but it is high-priced and CB's addition may critically influence the mechanical property which will be the substantial for getting the similar conductivity. In general, increasing of poly-matrix will is due to high content of CB, it is well-known that the electrical conductivity will rise. It is also rise due to the when the percolation threshold is reached. Percolation threshold generally cause by various factors (Wang, Hong, Feng, Badami, & Zeng, 2014). By adding conductive CB/CF in composite will make the materials easy to