EFFECTS OF POLARITY OF RUBBER STRUCTURE ON ELECTRICAL CONDUCTIVITY

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TABLES OF CONTENTS

ABSTRACT

EFFECTS OF POLARITY OF RUBBER STRUCTURE ON ELECTRICAL CONDUCTIVITY

Electrical conductivity of rubbers blends with variation of blend ratio and virgin rubbers that have different polarity such as NR (SMR 10), NBR (ACN 33%, ACN 55%) and ENR (ENR-25, ENR-50) were investigated through Impedance Spectroscopy HIOKI 3532-50 LCR HiTESTER Version 4.03E. Two-roll mill machine was used to masticate the rubber and sheet to a thickness of about 1mm. Virgin NR (SMR 10) was blended with NBR (ACN 33%) by using two-roll mill with different ratio. Each blend ratio will result in different polarity and electrical conductivity. The electric conductivity will increase as the polarity of the rubber is increased. The polarity of the rubber can be describe by refer to their molecular structure. NBR rubber with 55% of ACN content has the high polar thus it has the highest electrical conductivity among the other rubber. High composition of ACN content in NBR may increase the polarity of NBR rubber. Polar functional groups of nitrile group that attach to the ACN cause the rubber become polar. Natural rubber (SMR 10) has the lowest electrical conductivity because SMR 10 has no polar molecule. Polar molecule may influence the transportation or movement of electrons (charges) in the rubber particles, thus electrical conductivity can be generated easily and cause high electrical conductivity.

CHAPTER 1

INTRODUCTION

1.1 Background and problem statement

Rubbers are well known for their excellent electrical insulating properties, for this reason, electricians are using rubber gloves to protect themselves against electrical shocks in their daily work to install and/or repair electrical appliances or components. However, the insulating power of rubber depends on the type of rubber, whether the rubber is polar or not. It is well established that polar rubber is more conductive that non-polar rubber since the former carries charges and the latter does not. Rubber also can be used as conductive rubber to conduct away static charges in a coal mine. The charges associated with the polarity of the rubber allow conductivity. The rubber industry has grown and the development of new or modified rubber has also advanced.

New modified natural such as epoxidised natural rubber (ENR) has entered the rubber market. Two are main grades of ENR, namely ENR25 and ENR50 available in the market. These rubbers offer good swelling resistant towards hydrocarbon oil, thus compete with the established oil resistant rubbers such as polychloroprene (CR) and nitrile rubbers (NBR). The epoxy groups attached at the side chains of the polyisoprene units make ENR a polar rubber. Some considerable amount of work has been done on the mechanical properties of the rubber, but little effort was put on the electrical properties of the rubber. This project is carried out with a view to look into the effects of polarity on electrical conductivity.