

CHAPTER I

INTRODUCTION

1.1 General

Most of the poly(vinyl chloride) (PVC) is used in plasticized form⁽¹⁾, indicating that flexible PVC compound is a versatile plastic; that is, properties can be varied over a wide range depending on the specific formulating components chosen. Compounding involves the addition of plastics additives such as light and heat stabilizers, filler and plasticizers, which are necessary for the processing and stability of the final plastics⁽²⁾. Plasticized or flexible PVC compound comprises one of the most widely used polymeric materials. Its exceptional durability makes it a smart choice for products that must withstand extremely demanding use conditions⁽³⁾.

In order to give PVC its excellent flexibility, ingredients called plasticizers are added to the plastic formulation in varying amounts, depending on the specific needs of the finished products. Besides PVC, the semisynthetic cellulose esters and ethers need moderate amounts of plasticizers in order to be formed at all. Plasticizer gives them resistance to mechanical shock when they are used for screwdriver handles. Nylons frequently require small amounts of plasticizers to aid processing and to avoid thermal decomposition. Small amounts of plasticizers aid in processing thermosets, such as phenolics and melamines. Rubber compounding uses large amounts of extender oils (which are secondary plasticizers) in automobile tires⁽⁴⁾.

The majority of plasticizers of flexible PVC compound are phthalate esters with a wide variety of long chain alcohols. The remainders are also esters or polyesters and include those based on adipic, trimellitic, phosphoric, sebacic or azelaic acids⁽⁵⁾. The adipates are added to improve low-temperature flexible compound, and the

trimellitates to reduce volatile loss on heat ageing of electrical insulation. The plasticizer can determine whether the compound is useful in cold climate, whether it can be used as wire insulation in hot environments, and even whether or not it can be used around oil and gas or other chemical environments⁽⁶⁾.

Usually single phthalate plasticizer is used in flexible PVC, but the demand for a variety of properties of end products makes compounders to consider mixed plasticizers⁽⁷⁾. The use of plasticizer blends has been increasing. For example, chlorinated paraffin, which imparts flame retardant property and is cheaper than phthalate⁽⁸⁾. In addition, for some application of the flexible PVC compound with other polymer by contacting closely such as polycarbonate may cause the plasticizer in flexible PVC compound to migrate out. The plasticizer blends of dialkyl phthalates and trialkyl trimellitates in flexible PVC compound are used to prevent this migration problem⁽⁴⁾.

Nevertheless, the plasticizer together with other additives have potential to migrate from plasticized and flexible polymers to surrounding media. Migrating plasticizer often affects to a great extent the final mechanical and other properties of the plastic it is used in, as well as the properties of the medium this plastic is in contact with, causing severe variation of the performance of the final product with the following inconveniences: (1) A decrease in mechanical properties of the polymer, especially the flexibility because of the loss in plasticizer, and (2) A pollution of the liquid^(1,2,3,9). It is the responsibility of industry to demonstrate about PVC compound formulation with less migration of plasticizer.

1.2 Objective of the Research Work

To prepare a flexible PVC cable compound with less migration of plasticizer using plasticizer blends.

1.3 Scope of the Research Work

Six-formulation of the flexible PVC cable compounds are prepared by using various amounts of dioctyl phthalate (DOP) and chlorinated paraffin as plasticizer blends for oil ageing, flammability and compatibility test. The effect of oil ageing time and temperature on migration of plasticizer blends and hardness property will be determined after immersion in motor oils and silicone oils for 2 hours, 4 hours, 24 hours and 48 hours at 70°C and 120°C. The flammability test of PVC compounds is measured in term of oxygen index and compatibility of plasticizer and PVC by fusion characteristic is tested in a Brabender Plasticorder Torque Rheometer.