PREFACE

Conducting polymers, because of their unusual properties, have attracted great interest in recent years. Despite the short history, they have found a place in various applications. This thesis is about the development of conductive silicone rubber and nitrile rubber; and the synthesis, characterization and properties of novel conducting polymer – poly (p-phenylenediazomethine) and their blends with polyethylene, PVC and silica.

This thesis is divided into seven chapters as follows:

Chapter 1 presents a review of the literature in this field and the scope of the present investigation.

Chapter 2 deals with the materials used and the experimental procedures adopted for the study.

Chapter 3 is divided into three parts; Part-I reports the effect of different types of carbon blacks [e.g., acetylene black, lamp black, and ISAF (N-234) black], copper powder, and graphite on the electrical conductivity and mechanical properties of silicone rubber. Part –II reports the effect of different types of carbon blacks [e.g., N-220, N-347, and N-339 carbon blacks] on the electrical conductivity and mechanical properties of silicone rubber. The effect of temperature on the conductivity of silicone rubber vulcanizates is also studied. Part-III reports the effect of blending silicone rubber with high-density polyethylene on the conductivity and mechanical properties of the vulcanizates.

Chapter 4 is divided into two parts; Part I deals with the effect of concentration of acetylene black on the electrical conductivity and mechanical properties of nitrile rubber vulcanizates. Part II deals with the effect of blending of NBR with other polymers on the electrical conductivity and mechanical properties
of the vulcanizates at the same dosage of acetylene black. Preparation of nitrile rubber blends with NR, EPDM and PVC and the measurement of electrical conductivity and mechanical properties are reported. Part III deals with the variation in conductivity and mechanical properties of the vulcanizates with different composition of NBR/NR blends at the same dosage of acetylene black. Part -IV deals with the effect of temperature on the electrical conductivity of these vulcanizates.

Chapter 5 includes the synthesis and characterization of a new conducting polymer based on glyoxal and p-phenylene diamine. The synthesis of poly(p-phenylenediazomethine) was carried out in different solvents, like, methanol, toluene, m-cresol and DMF. D.C. conductivity, dielectric properties and thermal diffusivity of the polymer prepared in different solvents were determined. Effect of dopants on the d.c. conductivity and dielectric properties was also investigated.

Chapter 6 includes in-situ polymerization of glyoxal and p-phenylenediamine in different solvents containing different amounts of PE, PVC, and silica. The d.c. conductivity and microwave conductivity of each sample was measured. The effect of dopants like HClO₄, HCl and I₂ on conductivity was also studied.

Summary and conclusions of the present investigation is described in the last chapter, Chapter 7.

At the end of each chapter a list of references has been given. A list of abbreviations used in this thesis is also cited.