Preface

The survey of pertinent literature reveals a growing interest in research on the modification of epoxy resins to meet various requirements/demands. Epoxy resins can be modified by a variety of modifiers to achieve the desired properties. Among the different modified epoxy resins, epoxy-imide resins have gained the attention of researchers as they combine the versatility of epoxy resins and the high temperature properties of imide groups. Though the synthesis and characterization of different epoxy-imide resins have been reported by several authors, there exists limited information on their end-uses as adhesives, coatings and matrix resins for composites.

The present study has, therefore, been undertaken with a view to synthesizing novel epoxy-imide resins through the reaction of epoxy resins with imide-diacid/diimide-diacid curatives, and also to find out their end-use as adhesives. The present study also deals with the modification of epoxy-imide resins with reactive rubbers and siloxane linkages containing imide-diacid/epoxy resin. The feasibility of using epoxy-imide resins as matrix resins for composites and atomic oxygen resistant coating has also been investigated.

Chapter 1 opens-up with a general introduction to epoxy resins and their modification with different modifiers such as rubber toughening agents, siloxane modifiers, thermoplastics and imide group containing compounds. End-uses of the modified epoxy resins as coatings, films, encapsulants, composites and adhesives are also presented. This chapter concludes with a critical discussion concerning the objective and scope of the present investigation.

Chapter 2 deals with the materials used and the experimental procedures and the analytical techniques used in the present study. Chapter 3, divided into five parts, presents the results and discussion. Chapter 3.1 deals with the synthesis, characterization, and adhesive and thermal properties of epoxy-imides obtained through the reaction of Araldite GY 250 (DGEBA), Araldite EPN 1138
(polyfunctional, novolac) and epoxidized hydroxyl-terminated polybutadiene (EHTPB, an internal aliphatic epoxy resin) with imide-diacids. Synthesis, characterization, and adhesive and thermal properties of epoxy-imide resins obtained from the above epoxy resins and diimide-diacids are presented in Chapter 3.2. Chapter 3.3 deals with the modification of different epoxy-imides by using reactive rubbers such as EHTPB, and solid and liquid CTBN. Chapter 3.4 presents the synthesis, characterization, and adhesive and thermal properties of epoxy-imide resins containing siloxane linkages. Atomic oxygen resistance of a novel siloxane-imide-epoxy resin is also presented in chapter 3.4. Chapter 3.5 presents the studies on addition-type epoxy-imide resins.

Chapter 4 summarizes the findings of the present investigation together with some concluding remarks.

The work presented in this thesis have been presented in national and international conferences. One paper has been published in J. App. Polym. Sci. and another paper has been communicated to J. Appl. Polym. Sci. Two Indian patent applications have been submitted and eight more papers and a review article are under preparation.