Polyurethanes are one of the most versatile materials, with applications ranging from flexible foam in upholstered furniture to rigid foam as insulation in walls, roofs, and appliances to thermoplastic polyurethane used in medical devices and footwear, coatings, adhesives, sealants and elastomers used on floors and automotive interiors. Polyurethanes represent an important class of thermoplastics and thermosets since their mechanical, thermal, and chemical properties can be tailored by reactions with various polyols and isocyanates. Due to its versatile properties it has wide area of application and one such area of polyurethane application is to employ in surface coating. Incredible commercial surface coating materials are now manufactured industrially and marketed throughout the world due to excellent wear resistance, toughness, mechanical properties and chemical resistance.

There are several verities of surface coating which are known as decorative coatings, protective coatings, automotive coatings, industrial coatings, powder coatings etc. Decorative and protective coatings are mainly based on unsaturated oils (linseed oil, soyabeen oil, tung oil) and natural resins (shellac, rosins and kuari gum). Alkyd resin was based on modified natural oils, became important part of the coating industries.

However conventional Polyurethane coatings usually contain a significant amount of volatile organic solvents and other hazards products. Because of the demand of safety, economic and environmental protection laws this traditional solvent based polyurethane has been restricted since last decade and been gradually replaced by aqueous based polyurethanes. Recently, waterborne Polyurethane dispersion coatings technology have gained wide industrial interest because they can decrease air pollution, reduce risks of fire, and improve aspects of occupational health and safety. Waterborne polyurethane dispersions are commonly synthesized from polyester polyols or polyether polyols usually derived from fossil feed stock. Non edible oils and animal fats play an important part in renewable resources because of their ready availability and bio-degradability. Varity of polymers such as alkyd resins, epoxy resin, polyamides, vinyl polymers and also
Summary

Polyurethane have been synthesized based on vegetable oil as raw material. However limited attention has been paid to the synthesis of waterborne polyurethane dispersion based on renewable resources. Study on waterborne polyurethane dispersions based on various Polyethylene glycols, alkyd resin and castor oil (as polyols) has not been found academically and technically in spite of well defined application of all three components.

On bases of these the whole work of this thesis comprise of Synthesis, characterization and coating application of waterborne polyurethane dispersions derived from various polyols and to study their thermal properties (TGA and DMA) and Physio-Mechanical properties.

A brief note on surface coatings, Waterborne polyurethane dispersion (PUD) system and mechanism, Advantages and disadvantages of PUD coatings, Objectives and illustrating of the present work are summarized as introduction.

The synthesis of Waterborne Polyurethane dispersions by using different polyols such as polyethylene glycol, alkyd resin and castor oil, the aliphatic and aromatic di-isocynates, dimethylol proponic acid as ionic center and dibutyl tin dilurate as catalyst. By varying the mole ratios of polyols, di-isocynates and dimethylol proponic acid different waterborne polyurethane dispersions were synthesized.
Figure 1. Schematic representation of Waterborne Polyurethane dispersion based on polyethylene glycol and Isophorane diisocynate.

Synthesized Polyurethane dispersions are characterized by % NCO Content, IR spectroscopy, particle size analysis and various physical properties like, color, appearance, viscosity and self life. The results are discussed in this Chapter.

The dispersions were casted into films and were characterized by physical properties such as drying time, surface dry, Tack-free dry, hard dry and mechanical study (Tensile strength). Dispersions were finally used for
coating application and characterised for various tests. The detail about film casting and data interpretation is discussed.

Thermal properties of all the PUD films were studied through **Thermo Gravimetric Analysis (TGA) and Dynamic Mechanical Analysis (DMA)**.