SUMMARY OF THE WORK

The work embodied in the thesis has been divided into three parts and each of them contained three chapters. The first chapter of every part presented a brief review of the titled work, the second chapter of each part comprises the results and detailed discussion about the present investigation and the last chapter consists of detailed experimental procedures and references.

PART - I

Synthesis, Characterization and Viscosity Analysis of Homo and copolymer of Methyl acrylate and Evaluation of their Viscosity index improver and Pour Point Depressant Properties in Lubricating Oils

This Part has been divided into three chapters- **Chapter I**, **Chapter II** and **Chapter III**

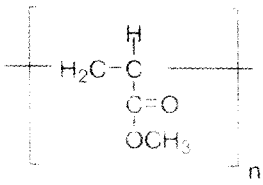
Chapter - I: It describes a brief review of the present investigation

Chapter - II: This chapter contains only one section

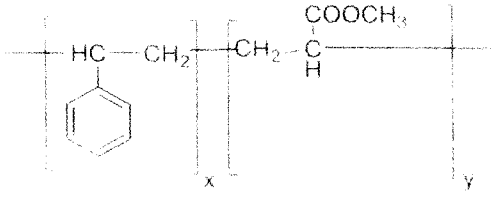
Synthesis, Characterization and Viscosity Analysis of Homo and Copolymer of Methyl Acrylate and Evaluation of their Pour Point Depressant and Viscosity Index Improver properties in different Base Stocks

Homopolymer of methyl acrylate (MA) and its copolymer with styrene were synthesized. The effect of solvents and initiator concentrations on percent yield, solubility, molecular weight and viscometric properties of each of the homopolymer and the copolymer were studied and compared. The characterization of the homopolymer and copolymer samples was carried out by FT-IR and FT-NMR spectroscopic method. The solubility test was performed in thirteen different solvents for the homopolymer and the copolymer samples prepared in three different solvents. The viscosity measurements of the synthesized homopolymers as well as that of the copolymers in the toluene solution at 303K, 313K and 323K were performed and compared. Viscometric properties derived

included the determination of specific viscosity (it determines the contribution of solute to the viscosity of the solution), the reduced viscosity (that provides the measurements of the polymer capacity in increasing the solution viscosity) and intrinsic viscosity. Then the homopolymers of methyl acrylate and the copolymers of methyl acrylate with styrene prepared in three different solvents were evaluated as pour point depressant and viscosity index improver in two different base oils.



Homopolymer of methyl acrylate



Copolymer of methyl acrylate with styrene

Chapter - III: This chapter consists of detailed of experimental procedures and References

PART II

Synthesis, Characterization and Viscosity Studies of Homo polymer of Methyl Methacrylate and Copolymers of Methyl Methacrylate with Styrene and 1–Decene and Comparative Performance Evaluation of these Polymers as Pour Point Depressant (PPD) and Viscosity Index Improvers (VII) in Lubricating Oils.

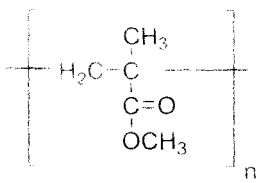
This Part has been divided into three chapters, **Chapter I**, **Chapter II** and **Chapter III**

Chapter – I: This chapter comprises a brief review of the titled work

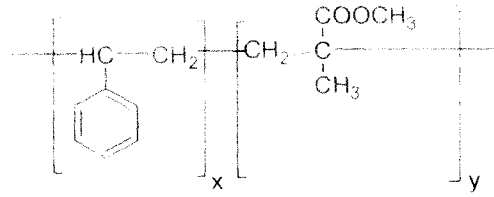
Chapter – II: This chapter is divided into three sections, **Section A**, **Section B** and **Section C**

Section A: It Comprises the **Synthesis, Characterization and Viscosity Studies of Homopolymer of Methyl Methacrylate and its Copolymers with Styrene and 1-Decene.**

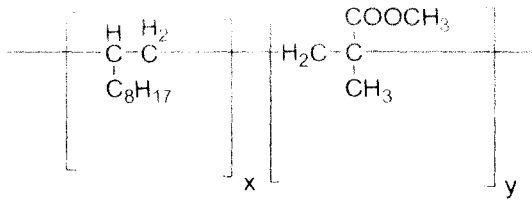
Homopolymer of methyl methacrylate (MMA) and its copolymer using different compositions of styrene and 1-decene were synthesized and characterized. The viscosity measurements of the synthesized homopolymer as well as the copolymer in the toluene solution at 313K were performed. Different equations were used to calculate intrinsic viscosity, viscometric constants values and molecular weight of the synthesized polymers. The values of intrinsic viscosity and viscosity average molecular weight obtained by the two methods (single point determination and graphical extrapolation) were compared in order to verify the validity of the single point determination for the polymers. Viscometric properties derived included the determination of specific viscosity (it determines the contribution of solute to the viscosity of the solution), the reduced viscosity (that provides the measurements of the polymer capacity of increasing the solution viscosity) and intrinsic viscosity.



Homopolymer of methyl methacrylate



Copolymer of methyl methacrylate with styrene



Copolymer of methyl methacrylate with 1-decene

Section B Comprises **Shear Stability and Thickening Properties of Homo and Copolymer of Methyl Methacrylate and Evaluation of their Pour Point Depressant properties in Lubricating (Lube) Oils.**

The degradation stability towards mechanical shearing (shear stability) of the homopolymer of methyl methacrylate (MMA) and its copolymer with styrene at different level of concentrations have been investigated. With a view to understanding the relationship between the thickening performance (percent increase in viscosity of the solvent in the additive of the unit weight of polymers) and shear stability of the polymer, the thickening abilities of the polymer were also determined and compared. Pour point depressant properties of the copolymers in comparison to the homopolymer were also tested in different base stocks

Section C Comprises **Comparative Performance Evaluation of Homopolymer of Methyl Methacrylate and Copolymer of Methyl Methacrylate with Styrene and 1-Decene as Pour Point Depressant and Viscosity Index Improver in three different Base Oils.**

The homopolymer of methyl methecrylate (MMA), copolymer of MMA with styrene and copolymer of MMA with 1-decene were synthesized and comparatively evaluated as viscosity index improver (VII) and pour point depressant (PPD) for three different lube oils. It was observed that the copolymers performed better as VII and PPD than the homopolymer. It was also observed that the occurrence of maximum performance depends on the mineral base oil used and the type and concentration of the polymers. The result of the work indicated the dependence of the performance of the polymeric additives on the chemical composition and structural characteristics of the polymer, the length of the alkyl side chains and molecular weight of the polymer.

Chapter III: This chapter consists of experimental procedures and References

PART III

Preparation, Characterization, Viscometric Analysis, Compatibility Studies and Evaluation of Homopolymer of Decyl Acrylate and its Copolymer with Styrene along with their Blends as Lubricating Oil Additives

This Part has been divided into three chapters, **Chapter I**, **Chapter II** and **Chapter III**

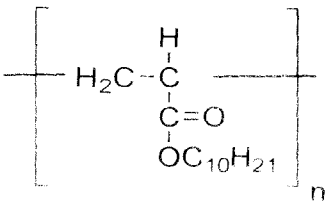
Chapter I A brief review of the titled work

This chapter is divided into two sections, **Section A** and **Section B**

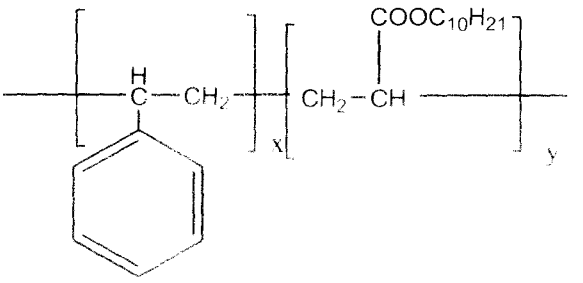
Section A comprises the **Preparation, Characterization, Compatibility Studies and Evaluation of Homopolymer of Decyl Acrylate and its Copolymer with Styrene along with their Blends as Lubricating Oil Additives**

Homopolymer of decyl acrylate (DA) and copolymer of decyl acrylate with styrene and polymer blends (mixture) with different percentage of these polymeric samples were prepared, characterized and evaluated as additives for lubricating oil. Viscometric studies have been conducted on the binary solutions (polymer-solvent) of homopolymer of decyl acrylate (DA), copolymer of DA as well as on their ternary solutions (polymer-polymer-solvent) having different concentrations of each polymer at 30°C in chloroform and toluene. The estimation of the compatibility degree of the above polymer pairs has been made by means of five criteria. Results show that in most of the cases polymer blends are compatible, except Ab_m data. This is probably due to non ideal behavior (hydrodynamic interaction) of polymers in ternary solutions. Data obtained in the solvents are not similar implying that polymer-polymer interactions and polymer-solvent interactions are both important for long chain polymers. The two solvents were chosen based on their ability to dissolve the two polymers and because of their differences in both structure and properties. The evaluation data indicates that compatible polymer mixtures act as much better viscosity index improvers (VII) and pour point depressants (PPD) than both the homopolymer and copolymer. With increasing

concentration of the copolymer in the blend, there is gradual increase in the additive performance.



Homopolymer of decyl acrylate



Copolymer of decyl acrylate with styrene

Section B comprises the **Viscometric Analysis of Homopolymer of Decyl Acrylate, its Copolymer with Styrene and their Polymer Mixture (Blends)**

Homopolymer of decyl acrylate (DA) and copolymer of decyl acrylate with styrene and their blends of different percentage were synthesized and characterized. The viscometric measurements of the synthesized homopolymer, copolymer and their blends were performed in two different solvents. Different equations were used to calculate intrinsic viscosity and viscometric constant values of the synthesized polymers. The values of intrinsic viscosity and viscosity average molecular weight obtained by the two methods (single point determination and graphical extrapolation) were compared. Measurements of viscometric properties included the determination of specific viscosity (it determines the contribution of solute to the viscosity of the solution), the reduced viscosity (that provides the measurements of the polymer capacity of increasing the solution viscosity) and intrinsic viscosity. The purpose of the viscometric study with the blends was to determine the solvent effect over the polymer-polymer-solvent (ternary) interaction in solution.

Chapter III Consists of experimental and References