

CONTENTS

	<i>Page</i>
AIM OF THE WORK	<i>1</i>
I. INTRODUCTION	<i>2</i>
I.1 CRUDE OILS CLASSIFICATION	<i>2</i>
I.1.1 Paraffinic crude oils	<i>2</i>
I.1.2 Asphaltic crude oils	<i>2</i>
I.1.3 Mixed crude oils	<i>3</i>
I.2 CRUDE OILS REFINING	<i>4</i>
I.2.1 Distillations	<i>4</i>
I.2.1.1 Atmospheric distillations	<i>5</i>
I.2.1.2 Vacuum distillations	<i>5</i>
I.2.2 Treatment processes	<i>5</i>
I.2.3 Chemical conversion processes	<i>6</i>
I.3 BASE OILS	<i>7</i>
I.3.1 Paraffinic base oils	<i>8</i>
I.3.2 Naphthenic base oils	<i>8</i>
I.3.3 Aromatic base oils	<i>8</i>
I.4 LUBRICATING OILS CLASSIFICATION	<i>10</i>
I.4.1 Industrial lubricants	<i>10</i>
I.4.2 Special related lubricants	<i>14</i>
I.4.3 Automotive engine oils	<i>15</i>
I.4.3.1 Lubrication requirements	<i>17</i>
I.4.3.2 Viscosity classifications	<i>17</i>
I.4.3.3 Gasoline engine oils	<i>18</i>
I.4.3.4 Diesel engine oils	<i>20</i>
I.4.3.5 Automatic transmission fluids	<i>20</i>
I.4.3.6 Automotive gear lubricants	<i>21</i>
I.4.3.7 Marine engine oils	<i>21</i>
I.5 LUBRICATING OIL ADDITIVES	<i>22</i>
I.5.1 Metallic additives	<i>24</i>
I.5.1.1 Antioxidant additives	<i>24</i>
I.5.1.2 Detergent - dispersant additives	<i>25</i>
I.5.1.3 Anti-wear additives	<i>25</i>
I.5.1.4 Rust inhibitors	<i>26</i>
I.5.1.5 Anti -foaming additives	<i>26</i>
I.5.2 Polymeric additives	<i>26</i>
I.5.2.1 Polymeric dispersant additives	<i>27</i>
I.5.2.2 Pour point depressant additives	<i>27</i>
I.5.2.3 Viscosity index improves additives	<i>29</i>

	Page
I.5.2.3.1 Function and properties of viscosity improvers	31
a) <i>Mechanism of function</i>	31
b) <i>Shear stability.</i>	33
I.5.2.3.2 Types of viscosity improvers	36
a) <i>Olefin copolymers</i>	37
b) <i>Hydrogenated styrene-diene copolymers</i>	37
c) <i>Styrene polyester</i>	38
d) <i>Methacrylates and polymethacrylates</i>	39
I.6 POLYMERIZATION TECHNIQUES	40
I.6.1 Addition polymerization	40
I.6.2 Condensation polymerization	43
I.6.3 Chain copolymerization techniques	44
I.6.3.1 Copolymerization equation	44
I.6.3.2 Types of copolymerization behavior	47
I.6.4 Terpolymer composition equation	49
II. MATERIALS AND METHODS	52
II.1 Polymerization reactions.	53
1.1 Binary copolymerization reactions of Styrene with different alkylmethacrylates.	53
1.2 Quaternary copolymerization of styrene with different alkylmethacrylate.	54
II.2 Physical and chemical properties of synthesized copolymers and quaternary copolymers.	54
2.1 Solubility.	54
2.2 Intrinsic viscosity.	54
2.3 Kinematic viscosity.	55
2.4 Viscosity index.	56
2.5 Thickening tendency value (Q).	57
2.6 Average molecular weight determination by using gel permeation chromatography – (GPC).	58
2.7 ¹ H NMR spectra.	60
2.8 IR spectra.	60
II.3 Blending.	60
II.4 Evaluation of performance properties of synthesized copolymers and quaternary copolymers.	61
4.1 Shear stability index.	61

4.2 Cold cracking simulator.	Page 62
4.3 Pour point	63
II.5 Comparative evaluation of synthesized copolymers and quaternary copolymers with commercial available viscosity index improvers and pour point depressant.	65
III. RESULTS AND DISCUSSION	66
III.1 Characterization of styrene-alkylmethacrylate copolymers at low conversion.	66
III.2 Characterization of styrene-alkylmethacrylate copolymers at high conversion.	67
III.3 Characterization of styrene-alkylmethacrylate quaternary copolymers at high conversion.	68
III.4 Performance characteristic of synthesized styrene - alkylmethacrylate copolymer and quaternary copolymers as viscosity index improvers.	69
4.1 Characterization of synthesized copolymers and quaternary copolymers.	69
4.2 Effect of chain length of the alkyl groups of alkylmethacrylate on the properties of synthesized copolymers.	70
4.3 Effect of monomers composition on the properties of synthesized quaternary copolymers.	71
4.4 Effect of sty-alkylmethacrylate copolymers and quaternary copolymers concentration on their properties as viscosity index improvers.	72
III.5 Evaluation of shear stability index (SSI) and cold cracking simulator (CCS) for formulated blends with high viscosity index (V.I.).	72
III.6 Evaluation of the prepared styrene-alkylmethacrylates as pour point depressants.	74
IV. REFERENCE	75
SUMMARY	80
الملخص العربي	1-6