**Summary**

In the present work, some novel polymers were synthesized and their exchange reactions with amines, hydroxylated compounds were investigated. Also, study of copolymerization reactions and evaluation of the prepared polymers as surface-active materials as well as their industrial and environmental applications such as petroleum-collecting and dispersing capacities, surface tension and micellization, Krafft point, emulsifying power and foaming properties.

This work contains three basic chapters:

***Chapter One:***  ***Introduction***

This chapter presents introduction which contains the principal of polymer chemistry, classification of surfactants, polymeric surfactant, literature survey of polymeric surfactants and aim of this study.

***Chapter Two: Materials and methods***

It includes the chemical compounds used in this study, procedures of all synthesized compounds and instrumental analysis such as Energy-dispersive x-ray (EDAX) spectroscopy, Fourier transforms-infrared (FT-IR) spectroscopy, 1H NMR spectroscopy, Tensiometer-K6 processor and conductivity meter.

***Chapter Three: Results and discussion***

It deals with the results obtained and their discussion and this chapter is divided into three sections:

**Section (A):**

First, the imide ester, N-methacryloyloxytetrachloro-phthalimide (NMATCP), was prepared by the reaction of*N*-hydroxytetrachlorophthalimide with methacrylic acid in the presence of *N,N'*-dicyclohexylcarbodiimide (DCC). The prepared monomer was polymerized by solution polymerization to give poly(NMATCP) according the following scheme:



The ability of poly N-methacryloyloxytetrachloro- phthalimide to enter into exchange reactions with amines was tested with (*N,N-*dimethyl-1,3-diaminopropane, 2-aminopyridine and 2-aminothiazole, *p*-anisidine and methyl 4-aminobenzoate) and hydroxylated compounds (*N,N-*dimethylethanolamine, salicylic acid, phenol, and benzyl alcohol). The percent of exchange reactions were almost quantitative as indicated by EDAX and 1H NMR analysis according the following scheme:



Second, copolymerization reactions of 1-vinyl-imidazole and lauryl methacrylate with different molar ratios were carried out by solution polymerization in dimethylformamide (DMF) at 65°C in presence of 1 mol % of BP.



The copolymer composition of each sample was calculated from 1H NMR spectroscopy. The monomer reactivity ratio (r1 and r2) of the system was calculated according to Fineman-Röss and Kelen-Tüdös methods. It was found r1 = 0.502, r2 = 5.084 by using Fineman-Röss and r1 = 0.488, r2 = 4.992 by Kelen-Tüdös methods.

**Section (B):**

First, the exchangeable polymers were converted to polymeric surfactants through quaternization reaction with DMS in the absence of solvent according the following scheme:



The surface-active properties of the polymeric surfactants such as surface tension, Krafft point, foaming power and emulsifying stability were studied.

It was found that the lowest value of critical micelle concentrations was recoded for **PS Am-1** (0.038 %, wt/v) by surface tension measurements and (0.037 %, wt/v) by conductivity measurements. All polymeric surfactants showed Krafft point below 0 oC. The results for emulsion power indicated that **PS Al-1** needs long time (40 min.) to separate the desired amount of water than the other synthesized compounds. also, **PS Al-1** presents better foaming height (110 mL).

Second, the polymeric surfactants of [VIM-co-LMA] copolymers were prepared by the reaction of the synthesized copolymers with excess amount of DMS in the absence of solvent according to the upcoming scheme:



It was found that the lowest value of critical micelle concentration was observed for **PS2** (0.015 %, wt/v) by surface tension measurements and (0.013 %, wt/v) using conductivity measurements. All polymeric surfactants showed Krafft point <0 oC. The results for emulsion power indicated that **PS3** has the highest emulsion stability (37 min.) than other synthesized compounds. Also, this compound presents the best foaming height (160 mL).

**Section (C):**

The study of collecting and dispersing activities towards petroleum thin films has been carried out by the quaternary exchangeable polymeric surfactants. **PS Am-3** exhibited very high petroleum-dispersing in undiluted form, whereas Kd ranges from 91.60 to 93.20%, τ= 30-96 hr. (in fresh water) and in diluted form, whereas Kd ranges from 95.7 to 98 %, τ= 5-96 hr. (in distilled, fresh and sea waters).

Also, study of the petroleum-collecting and dispersing capacities of polymeric surfactants of [VIM-co-LMA] showed that **PS2** gives very high petroleum-dispersing in both diluted and undiluted form, whereas Kd ranges from 91.30 to 97.50%, τ= 55-166 hr (in distilled, fresh and sea waters). Compound **PS3** in undiluted form gave a good petroleum-collecting effect in all used waters and the values range from 30.11 to 33.50, τ = 30-166 hr.

Second, evaluation of the antimicrobial activities of the prepared compounds were carried out against a range of microorganisms comprising bacteria and fungi.

1. The results of antimicrobial activity of the exchangeable polymer showed that **Al-4** has high effect against *S. aureus* by inhibition zone 26 mm. For *E. coli* compound, **Am-3** showed clear zone 29 mm, and for *A. niger,* compound**Am-2** presented zone of inhibition 44 mm. They gave negative results against the fungus *R. oryzae*.
2. The results of antimicrobial activity of quaternary exchangeable polymeric surfactants showed that **PS Am-3** has high effect against *S. aureus* by inhibition zone 30.3 mm. For *E. coli,* compound **PS Al-1** showed clear zone 11.6 mm and for *A. niger,* compound **PS Am-1**presented zone of inhibition 24 mm. However, all quaternary exchangeable polymeric surfactants gave negative results against *R. oryzae*.
3. Antimicrobial activity of polymeric surfactants of [VIM-co-LMA] copolymers showed that **PS4** afforded high effect against *S. aureus* by inhibition zone 48 mm but for *B. cereus,* compound **PS3** showed clear zone 16 mm. In addition, **PS3** furnishedzone of inhibition 25 mm against *A. niger* but all these surfactants showed no activitys against the fungus *R. oryzae*.

This thesis contains also references, Arabic and English summaries.