Summary

The present work is concerned with the preparation, characterization, studying the electrical, and mechanical properties as well as chemical stability against different solvents for polyester (UP-265) and its some polymer composites, nickel, cupper and bronze.

The work includes five chapters:

- **The first chapter,** is the general introduction, which contains literature survey about the investigated samples and the aim of work.
- **The second chapter,** describes and explains the theoretical review and the different methods of calculation used for analyzing the results (dc-, ac-conductivity, dielectric constant E‘ and dielectric loss a").
- **The third chapter,** shows the experimental work which consists of

  (i) The preparation methods of the investigated composites by using different fillers as nickel, cupper and bronze with different concentrations 0.05 - 0.25%.

  (ii)The studies and the techniques used in the samples investigations are FT-IR, TG, DTA, TMA as well as two probes dc- and ac-electrical measurements, chemical duration, surface morphology, mechanical properties and adhesion properties..

- **The fourth chapter,** deals with the characterization of the samples and investigating their thermal and mechanical stability.
- **The fifth chapter,** includes the results and the discussion where as:

1. The electrical conductivity a for polyester composites is studied at a frequency range from 0-10^4 Hz and measured at different temperatures from room temperature to temperature before decomposition and showed the following:

   (a) The dc- and ac-conductivity for all samples showed different conduction types (semi-conducting, insulating or metallic) depending on the measuring temperature.

   (b) DC-conductivity values decrease in the order: pure-polyester > poly.-cupper 0.25 % > poly.-bronze 0.25% > poly.-nickel 0.05% > poly.-nickel 0.25% > poly.-bronze 0.05% > poly.-cupper 0.05%.

   (c) AC- conductivity values decrease in the order: poly.-cupper 0.25% > poly.-nickel 0.05% > poly.-cupper 0.05%> poly.-nickel 0.25% > pure polyester > poly.-bronze 0.05% > poly.-bronze 0.25%.

(d) The change in conductivity values was explained on the basis of the change in the concentration of additive compounds, and the molecular arrangement, which affect on the polarization of investigated materials.

(e) 'J_{ac} are higher than lad$_e$ for all samples, at any temperature, referring to the presence of polarization effect. At the same time the ac-conductivity increases with increasing the frequencies due to the decrease in the barrier effect with the increase in frequencies (i.e. hopping mechanism predominates in the investigated samples).

(0 The dielectric constant E' values for polyester and its composite showed the compounds can be classified as ferroelectric which includes compound of cupper and nickel, whereas the composites containing bronze can be classified as sample dielectric. The dielectric constant s' and dielectric loss s" showed anomalous behaviour at temperatures coincide well with those found in electrical conductivity measurements.

2. The effect of different materials (acids, bases, organic solvents and salts solutions) on investigated materials are also studied by observing the changes occurring in each of sample weight and in IR-bands before and

after chemical treatment. The results showed the following:

(a) FT-IR showed no or slight changes in the positions and intensities of peaks different investigated materials.

(b) The weight loss for the polymers and its composites can be arranged according to: polyester > poly-cupper 0.05% > poly.-cupper 0.25% > poly.-bronze 0.05% > poly-bronze 0.25% > poly.-nickel 0.05% > poly.-nickel 0.25%. The composite containing nickel filler is the most stable composites against the chemical attacking.

3. The adhesion properties of polyester with different surfaces showed that it has good adhesion characters with wood-wood, glass-glass, iron-iron, PVC-iron.

4. The mechanical properties of polyester composite is affected by the distribution of fillers inside the polyester matrix.

The introducing of nickel filler inside polyester causes a decrease in its tensile strength. While the less homogeneity of both cupper and bronze in the polymeric matrix leading to more reinforcement for polymer and hence causes more increase in its tensile strength.

5. The filler distribution in polymeric matrix showed that nickel produce higher homogeneity with polyester, while cupper and bronze give less homogeneity with polymer due to coagulation of their particles to form thin layer on the composite surface.