In spite of the fact that fresh groundwater resources in Egypt contribute to some 20 % of the total potential of water resources, yet the available quantity is less than 7 % of total sources due to several reasons: (1) high concentration of iron and manganese that lead to many problems: (i) Promote the growth of gelatinous masses of iron and manganese bacteria which readily cause partly or completely clogging of pipes cause trouble in domestic and industrial use. (ii) iron will cause reddish-brown stains while manganese causes a brownish-black stains. (iii) high concentrations will give water a medicinal or metallic taste. (iv) long time consumption of drinking water with high concentration of iron causes liver diseases. (2) high salinity of ground water in desert zone needs excess of treatment costs. (3) ground water in desert present at higher depth needs high power pumps. (4) continues contamination of ground water with leakage of industrial waste influents.

Accordingly, the present study is a trial for treatment of ground water in Kalyoubia Governorate using activated carbon prepared from rice husk. This trial aimed to decrease environmental pollution on one side and the treated water may be reused in all applications and thus the agro-residue (rice husk) becomes a useful substance.

The thesis consists of three chapters as follows:

__Chapter 1:__ An introduction which gives a brief information on water sources in Egypt, main sources of ground water contamination, traditional methods of treatment (e.g. poly phosphate, ion exchange, green sand filter and oxidation). It also includes adsorption technique, activated carbon in adsorption, preparation of activated carbon, raw materials used for activated carbon, removal of heavy metals by activated carbon, equilibrium adsorption models as well as batch and column treatment techniques.

Chapter 2: This chapter is the experimental section and it is divided into two main parts.

The 1st part: here we explained the sampling procedures in four stations (I,II,III,IV) of Kalyoubia Governorate during the four seasons in the period March 2003-February 2004. The physicochemical parameters for all samples before and after traditional treatment (physical parameters: EC, TS, TDS, TSS as well as chemical parameters: pH, COD, anions, cations, nutrient salts and heavy metals) were determined.

The 2nd part includes the preparation of activated carbon derived from rice husk by 70 % H_3PO_4 at 500° C and characterization of this carbon using several techniques: (S_{BET} , density, porosity pH, FTIR, ash and grain size). It also includes the factors affecting adsorption experiments for iron and manganese treatment from ground water (station I, winter) using the prepared carbon e.g. equilibrium time, carbon dose, adsorption rate and adsorption isotherms in batch studies as well as column studies .

Chapter(3): includes the results and discussion in this thesis. It is divided into 2- main parts .

1st part: It explains the annual averages of all physico-chemical parameters determined for all samples before and after traditional treatment respectively. The values are presented as follows: TS (892.1-858.4 mg/l) permissible limit up to 1500 mg/l, TDS (783.6-782.6 mg/l) permissible limit up to 1200 mg/l, EC (972.7-924.2 µmohs/cm) permissible limit up to 1000 µmohs/cm, pH (7.8-7.9) permissible limit up to 6.5 - 9.5, iron (2.1-0.4 mg/l) permissible limit up to 1.0 mg/l, manganese (3.5 - 0.4) permissible limit up to 0.5 mg/l , zinc(0.4 - 0.5 mg/l) permissible limit up to 5 mg/l, lead (0.1 - 0.1 mg/l) permissible limit up to 0.05 mg/l, sulphate (80.3 - 84.5

mg/l) permissible limit up to 400 mg/l, chloride (129.9 - 118.5 mg/l) permissible limit up to 500 mg/l, calcium (83.5 – 76.0 mg/l) permissible limit up to 200 mg/l, magnesium (110.2 - 115.3 mg/l) permissible limit up to 150 mg/l, sodium (54.7 - 55.7 mg/l) permissible limit up to 200 mg/l, potassium (9.3 - 9.0 mg/l) permissible limit up to 12 mg/l, nitrite (7.5 - 17.0 μg/l) permissible limit up to 50μg/l and nitrate (199.2 - 68.9 μg/l) permissible limit up to 10 mg/l . (a) The results indicate that all parameters cited were within the normal limits according to WHO and Egyptian specification except:

- Concentration of Fe^{2+} and Mn^{2+}in all stations and in all seasons before traditional treatment which exceeded the permissible levels. Thus treatment is a must.
- Concentration of lead is almost out of limits (>0.05mg/l) in the stations under investigations.
- Concentrations of Mn^{2+}after treatment still exceeded the permissible levels at station IV in summer.
- TDS before and after treatment are within the normal limits (1200 mg/l) except station IV at all seasons. This may be due to contamination of the wells with fertilizers and some industrial pollutants. Similar results are recorded for TS in station IV in the autumn and winter season.

(b) Fe^{2+} and Mn^{2+} ions have high positive correlation coefficient (r =1).

(c) The most common salts determined in ground water samples under investigation are (magnesium bicarbonate, calcium bicarbonate, sodium bicarbonate, sodium chloride sodium sulphate, calcium sulphate and magnesium sulphate).

The 2nd part includes the physico-chemical properties of activated carbon (RH-57) prepared by chemical activation: S_{BET} (surface area = 419 m^2/g), V_p (total pore volume = 0.213cm^3/g), d (pore width = 1.076 nm), ash content 31= (%), pH =5, apparent density = 0.25 g/cm^3, packed density=0.33g/cm^3, and Grain size = 0.6 mm) and the factors affecting the adsorption system in batch mode indicate that:

1. The equilibrium time for adsorption of Fe^{2+} and Mn^{2+} ions onto RH-57 at room temperature (25 ±1°C) are 4 hrs and 5 hrs for Fe^{2+} and Mn^{2+} respectively.
2. The percent removal (R %) reaches 100 % from 1L solution samples of station I, winter containing initial concentration 2,3 mg/l of Fe^{2+} and Mn^{2+} respectively using 8 mg RH-57 .
3. The rate constant of sorption of Fe^{2+} and Mn^{2+} ions are 0.0097min^{-1} and 0.00306 min^{-1} respectively .
4. Correlation coefficients of Fe^{2+} and Mn^{2+} ions are 98.8 % and 90.4 % respectively when applying Langmuir isotherm and 99.7 % and 73.1 % when applied Freundlich equation.
5. The adsorptive capacities at equilibrium time are 357 mg/g ,and 625 mg/g for Fe^{2+} and Mn^{2+} ions respectively and the possible working mechanism:
   - High concentration of TDS about 900mg/l in cases studied cause increasing of ionic strength which compressed the double layer Such compression helps the carbon particles and metal ions to approach each other more closely.
   - Chemical bonding can be responsible for the adsorption of the two metal ions onto the RH-57 carbon. The covalent bonding results from the sharing of the free electron pairs between the surface

oxygen atom and the metal ion or the formation of an

$O...M^{n+}$ bonding.

- The ion–exchange reaction on the silica surface is accomplished through the substitution of protons of the surface silanol groups by the metal ions from solution, as follows :

$$M^{n+} + x(\equiv SiOH) \leftrightarrow M(\equiv SiO)_x^{(n-x)+} + xH^+$$

In the dynamic mode, the column with diameter 1.5 cm, bed depth 15 cm, flow rate 100 ml/min. and carbon mass = 5 g was used. The % removal of iron reached 100 % for an initial influent concentration 2 mg/l and the column may be regenerated by 0.5 ml of 1 % $KMnO_4$ (0.006 M) and can be reused for at least 5 times without any significant loss in carbon mass.

In conclusion, it was obvious that the efficiency of activated carbon was higher than that of traditional methods for iron and manganese removal and it reached to 99 % for both using RH-57 whereas in traditional treatment, % R for iron reaches 70 % and for manganese 85 %. Thus, activated carbon RH-57 is favorable than traditional treatment based on:

- More efficient.
- Solve some environmental problems.
- Local replacement technology.
- Reduce chemical contamination in traditional methods .
- Save foreign currency