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## The Kinetic Oxidation of Manganese (II) In Presence of the Inorganic and Organic Ligandes

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### Abstract

It's experimented the manganese (II) oxidation without ligandes presence and with presence of ligande (inorganic and organic). It's founded that the  $Mn(aq)2+$  oxidation is autocatalytic and the speed execution is followed by the differential equation –  $d[MnII]/dt = k_0[MnII] + k_1[MnII] \cdot [MnOx]$ . The reaction is catalyzed with ligandes filling in  $pH = 9.40$  and  $pH = 9.70$  whereas in a value of  $pH = 10.20$  only boron has speeded the process of oxidation. As well along the Mn (II) oxidation process we acquired  $MnO_2$  indissoluble which then is separated by filtration when is believed that Mn (IV) oxides are with high quantity of manganese oxidation in nature.

It's founded that with pH value rising can rise and the recruit speed of Mn(II) oxidation, where this speed is considerate as a superficial catalytic process and can have a main role in iron conveyance and manganese in the natural system.

### 1. INTRODUCTION

Manganese is a white and grey metal, with a pinkish track and very brittle but a strong metal element. It is compound with over one hundred other metals. Manganese is a reagent element and it's easy to combine with ions into water and air. In ground it is found in a high number of minerals with different physical and chemical characteristics. A lot of manganese tracks are very important for a good health and it's main element for functioning of the animal organism and could serve for the enzymes activation. Steel became stronger when it is in cahoots with manganese. Manganese has the same elaboration in cahoots with aluminum and copper. Some of the manganese metals and other metals are diffused in the end of ocean. Manganese in nature it is very diffused, in rock of earth. It is the tenth element about the diffusing and it has more than the other metals as well as iron. Compositions of manganese (II) in dip oxidate and precipitate, when the low staging 0.02 mg/liter of manganese in



water gathering can create covering that later can become a black precipitate in a dirt form (Bean 1974). In water-level, manganese dissolves in a suspended form, dependant from the pH factors, the presents ions and the reduce potential. The  $Mn^{2+}$  ions are dominant into water with pH 4-7 but more oxidation forms can be found in high value of pH. The pure manganese oxide (IV), without water can't be hydrated because it is indissoluble, but when it come into the water dip always can be hydrated (with brown color), but never till the  $MnO_2 \cdot 2H_2O$  form or  $H_4MnO_4$  but the hybridization continues till the  $MnO_2 \cdot 2H_2O$  or  $H_4MnO_3$  who is called manganese acid.

The manganese oxide (IV) is used for: producing of iron alloy, for dishes discoloration, for reagent preparing, for drying of the black color, this is why it is very necessary to proceed and the manganese oxidation in different water. The manganese oxide (II) in attendance of different inorganic and organic connections, depend from the recollection of connections using it is a complicated oxidation mechanism. Along the kinetic of the manganese oxidation (II) we can come into the  $MnO_2$  indissoluble, which in nature it is found as a manganese oxide (IV) - the gray stone, hausmantani  $Mn_3O_4$  and braunit  $Mn_2O_3$ . The manganese oxide (IV) is believed that are in high quantity in the manganese oxidation in the nature. The crumbs of the manganese compositions in air diverge completely and depend from the source, for ex. Iron alloys are productive, bakery cobbles and the energy factory. The manganese crumbs on the average in air nature near industrials sources are  $220-300ng/m^3$ . Whereas the manganese crumbs in the urban and rural location out of sources are  $10-71ng/m^3$  (Barceloux 1999). Anyway the human activity it is responsibility about the contamination of manganese in some water places. The snows analyses which are made in the urban location of Montreal, Canada it was impossible to put intercommunication between the manganese recollection near autos and the manganese recollection into snow (Loranger 1996). However the manganese oxidation is followed with precipitate which is a important mechanism for eliminating Mn (II) from the waters lake. The chemical environment of manganese into natural water it is inspected in high space with reduces transformation between manganese ions (II) dissoluble and the  $MnO_2$  indissoluble (Stumm and Morgan 1981). However, the manganese oxide (IV) in thermodynamics aspect it is stability form of manganese into oxygenation water. The manganese oxide (IV) often is into the sea water as Mn (II) or in a different rate of oxidation. The chemical oxidation of Mn (II) into the sea water it will be the slow process which is improper for the kinematics oxidation. For example: the manganese kinetic oxidation between alkaline with molecular oxygen.

## **The experimental part**

In the beginning it is elaborated the calibration curved line, based in the MORGANTT<sup>26</sup> method to determine the quantity of oxidation manganese via spectrophotometer.



To determine the calibration curve line, in the beginning are prepared ten standard series with known recollection of manganese dioxide in a normal dishes from  $100\text{ cm}^3$ , in those dips growing  $50\text{ cm}^3$  bicarbonate of sodium ( $\text{NaHCO}_3$ ) with recollection  $10\text{--}3\text{ mol/dm}^3$ , after every dip we add  $2\text{ cm}^3$  organic reactive 4, 4', 4'' methyltwonitro (N, N – twomethyl anilin) and  $5\text{ cm}^3$  pufer acetous that the pH of the dip should be 4.00 at once is showing the violet color of these dips and we fill in with clarity water till the sign. From these dips fill in  $1\text{ cm}^3$  and measuring the absorbance in spectrophotometer with sodden length  $591 = \lambda\text{ nm}$  because in this sodden length we have maximal absorbation. As a white demonstration we use that experiment which has those entire components expect suspension of  $\text{MnO}_2$ . The intensive violet color in  $\text{pH} = 4.00$  has inboard more than one hour. The fast measurement in spectrophotometer decrease values errors that are featured; certainly by reason of the reaction that can happen between the base and the dip oxygen or the oxidation proceed with influence of the UV ray.

For the manganese oxidation we work in this way: in one laboratory glass from  $1000\text{ cm}^3$  pull out  $10\text{ cm}^3$  puffer carbonate  $\text{pH}=9.400$  with recollection  $0.1\text{ mol/dm}^3$  as it were the common recollection of puffer to come  $10^{-3}\text{ mol/dm}^3$  in the same time let off the magnetic bland and the oxygen from the proof-sheet to achieve the dip homogenization, with continuance from 30 min. Then is measure the value of dip pH and is added  $10\text{ cm}^3$  manganese chlorine (II) ( $\text{MnCl}_2$ ) with recollection  $2 * 10^{-2}\text{ mol/dm}^3$  as it was the common recollection of manganese to come  $2 * 10^{-4}\text{ mol/dm}^3$ . After we add  $10\text{ cm}^3$   $\text{MnCl}_2$  in the same time is radiated the chronometer and after 5 min we do the first measure like this: from the glass that oxidation finished. We take  $10\text{ cm}^3$  and we add in other normal dishes from  $100\text{ cm}^3$  when before we have added  $5\text{ cm}^3$  puffer acetate with  $\text{pH}=4.00$  and  $2\text{ cm}^3$  organic indicative who is used for telling us the color, and after showing the violet color the other part we fill with water till the sing. After this action we do the absorbance in spectrophotometer filling them from  $1\text{ cm}^3$  and after measuring the absorbance we can found the recollection of  $\text{MnO}_2$  via the calibration curve line. In the same way we do after 10, 20, 30, 60, 90, 120.... minutes till we win the constant value of absorbance that is to say that all that manganese quantity is oxidated in  $\text{MnO}_2$ .

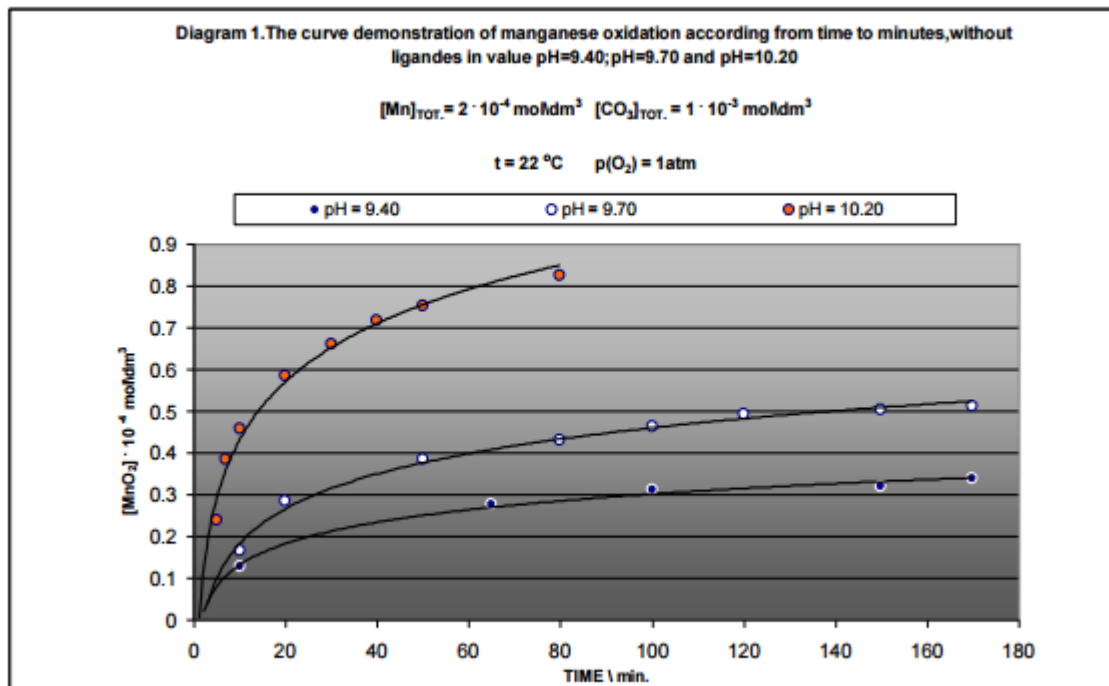
While in the beginning the quantity of manganese have been very high, the oxidation is accomplished faster in short intervals and then in longer interval. In the same way we do when we measure the manganese oxidate in  $\text{pH}=9.70$  and  $\text{pH} 10.20$ .

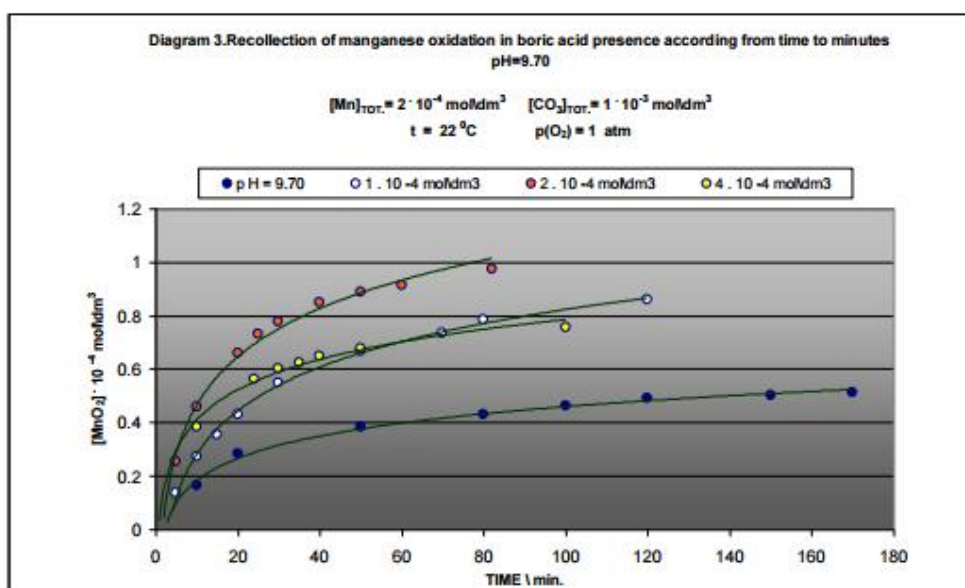
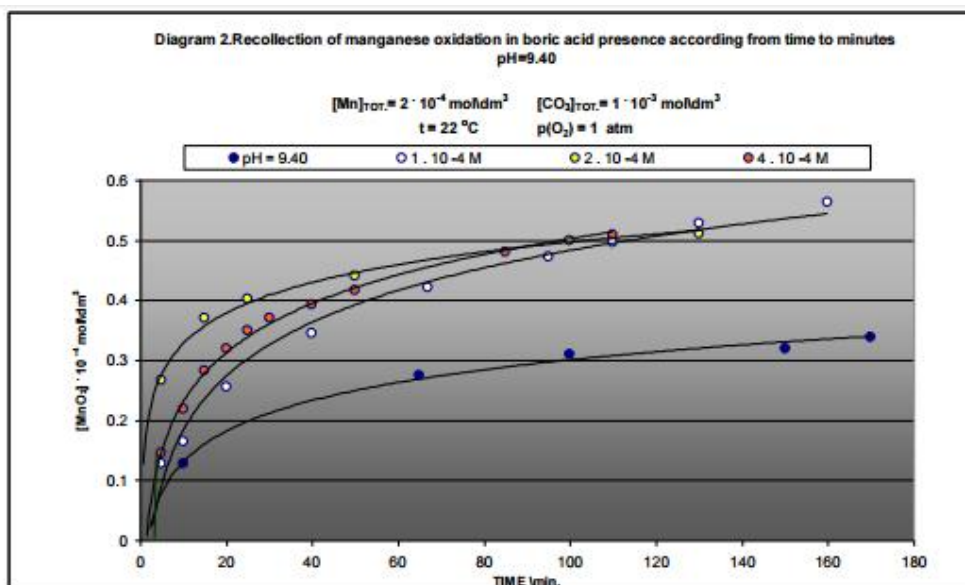
## Results and discussions

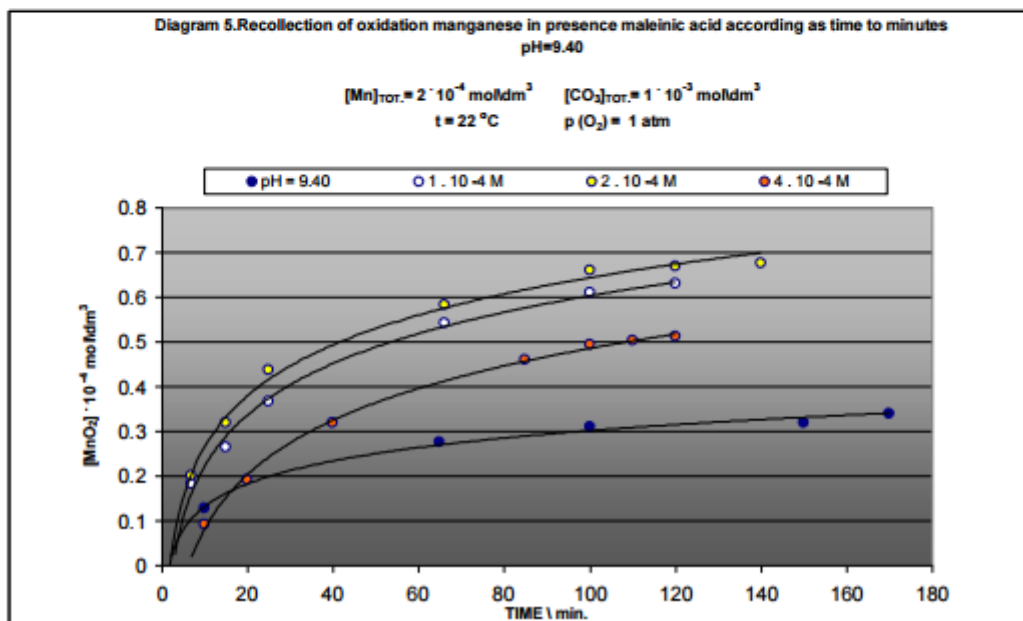
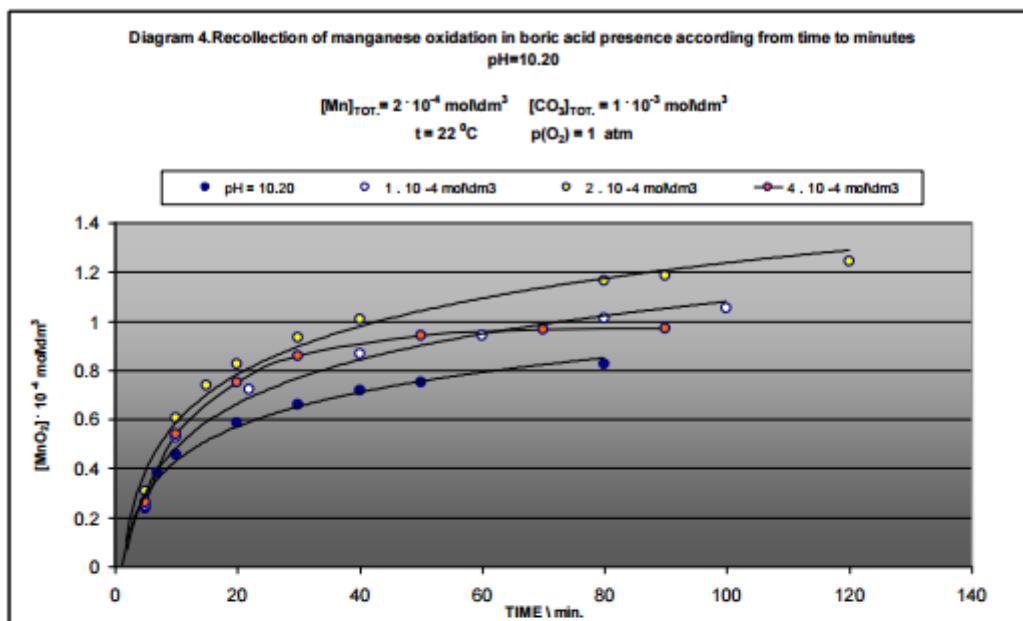
It is experimented the manganese oxidate without ligandes presence in different pH values. The curved lines that are showed about the manganese oxidation without ligandes depended form time in minutes and in different pH values are exhibited in the diagram 1.

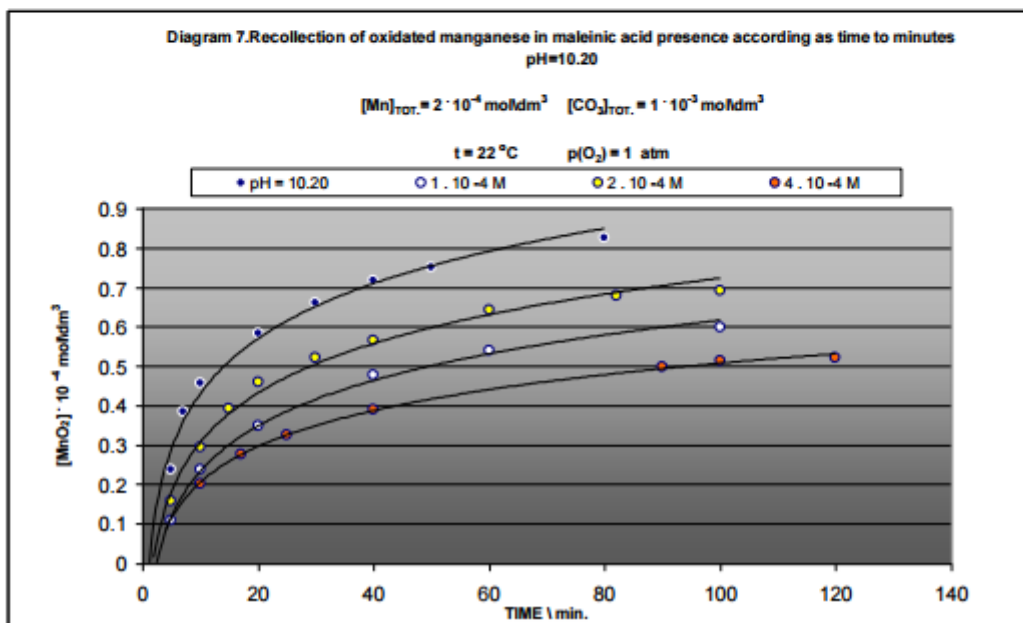
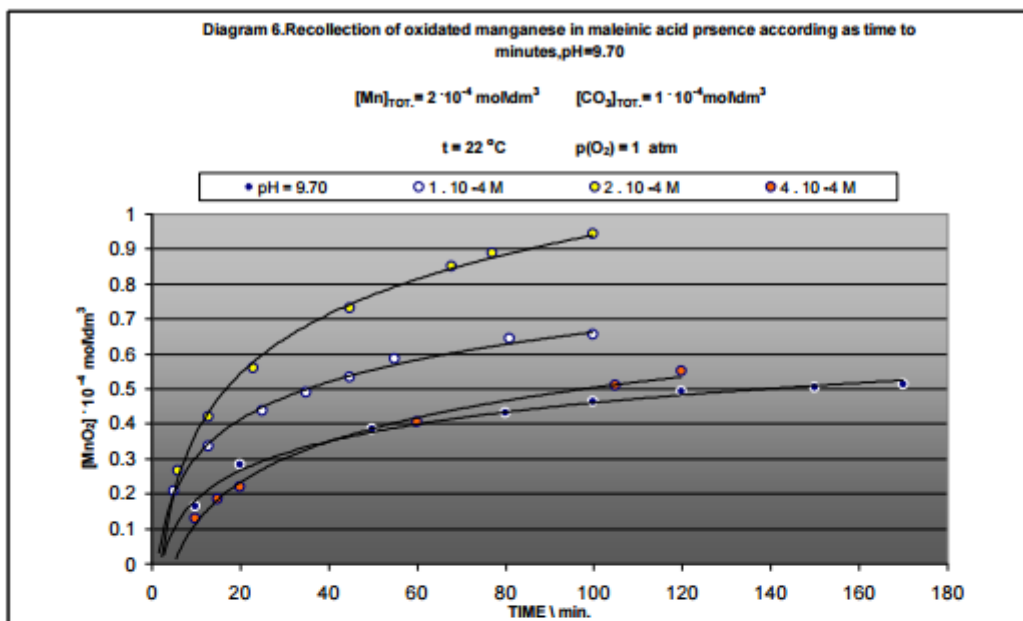
The kinetic of manganese oxidation is very slowly in a small pH values whereas in a pH value  $\text{pH}=10.20$ , the kinetic of oxidation is faster about 100 min. small crumbs start precipitation and tells us the presence of  $\text{MnO}_2$ . The recruit rate of oxidate ( $\text{MnOx/t} \cdot \text{min}^{-1}$ ) can be commutated from the incline part of tangent of the oxidation curve line in the first diagram. The curve inclination of experiments point is 0.60 which distinguished from the MORGANIT<sup>26</sup> results about the manganese oxidation with a value from  $\text{pH}<9$ .

It is experimented the influence of oxidation Mn (II). The manganese oxidation is finished in the same value of pH as a manganese oxidation (II) without ligandes. All used recollections of boric acid for the three pH values has speeded the process of manganese oxidation beside the same system, without ligandes in the diagram 2.3.4. The boric acid has had catalytic effect in the manganese oxidation rate and this is important to say because it's component of Sea Water. The mechanization still is not verified. It is experimented the manganese oxidation (II) in presence of maleinic acid in different values of pH, the diagram 5.6.7. As we see in a value of pH 9.4 and pH = 9.7 the kinetic of manganese oxidation (II) is speeded. This one tells us the complication of the manganese oxidation (II) mechanism.









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