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Ferric Nano particles as a material for biological applications; structural properties and biocompatibility

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ABSTRACT: Ferric Nanoparticles produced by chemical method in order to further its use in biological applications. Aqueous solution contains Iron chloride and thioacetamide and heated for 90minutes as deposition time. Aqueous solution temperature for synthesis was about 75ºCtemperature and kept at 10pH. Ferric Nanoparticles achieved from evaporated Aqueous solution in special oven at 250ºC temperature. X-ray diffraction (XRD), Scanning electron microscopy (SEM), Atomic Force Microscopy (AFM) analysis proved the production of Ferric Nanoparticles. Nano particles have poly crystalline structure with bones like shapes by fraction of voids between them.

Keywords: Ferric, Nano particles, biological applications, Chemical bath deposition

INTRODUCTION

Iron is an essential element for correct brain function. Iron deficiency changes some behaviors such as anxiety and nociception. Recently, Nano-iron, Ferric or ferro oxide (Nano-Fe_2O_3 or Fe_3O_4), are used in various applications in agriculture, industry and medicine, but their effects on the heath and behavior is not clear. In this study, the effects of Fe_2O_3 Nanoparticles on animal models of anxiety and nociception were investigated (Leung and Kaplan 2009, Spinelli, 2004, Bloch *et al*.,). Also, Iron oxide Nanoparticles, have been approved by both the US Food and Drug Administrationand the European Medicines Agency for IV medical use. Iron may cause conjunctivitis, choroiditis, and retinitis if it contacts and remains in the tissues. Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in development of a benign pneumoconiosis, called sideros is, which is observable as an x-ray change. Fe_xO_y (x=1-3 and y= 0-4) Nanoparticles can produce by several methods, such as chemical vapor deposition(CVD) (Mathur *et al.,* (2006), MOCVD(Chatzitheodorou *et al.,* (1986), reactive ion beam sputtering (Birkholz *et al.,* 1992) and laser-assisted CVD(Sivako *et al.,* 2005), result in excellent quality thin layers, they lack flexibility and cost effectiveness.

The aim of this work is to produced Fe_xO_y(x=1-3 and y= 0-4) Nanoparticles and investigated about their Nano structure and crystalline properties by XRD, SEM and AFM analysis.

EXPERIMENTAL DETAILS

Nano particles prepared by CBD were grown from solution containing Thioacetamide (TA) and Iron Chloride ($FeCl_3$) as sources of S^{2-} and Fe^{3+} respectively, acetic acid was used as complex agent of the Fe^{3+}.

The resulting solution was diluted to 100mL with water distillated. Deposition parameters were: [$FeCl_3$]=25mM;[TA]=350mM; Acid acetic = 300mM. During the deposition the bath temperature was 75°C. The solution pH kept at10 constant value. After 90 minutes deposition time, aqueous solution transferred to special oven and evaporated at 250°C for about one hour.

Crystal and phase structure of the deposited Ferric Nano particles were identified using an X-Ray X-pert MPD diffractometer (CuK_α radiation, γ =0.15406nm) with step size of 0.03 and count time of 1s per steps. Nano structures were investigated by SEM(S-3400, Hitachi, Japan). Surface physical morphology were obtained by means of AFM (Dual Scope ^{TM}DS,95-200/50).

RESULTS AND DISCUSSION

Figure 1 shows the X-ray diffraction pattern of Ferric Nano particles, produce at 90 minutes chemical deposition time, by CBD method. As it can be seen Nano structures are polycrystalline and the most peaks belong to α-Fe_2O_3 and few peaks relate Fe. Noisy XRD pattern relates to glass plate that we put Nano particles in to it for X-ray analysis.

Fig. 2 shows the SEM image of produced Ferric Nano particles in this work. As it can be seen, Nano particles grown in different shapes as stalk and bones.

Figure 3 shows the AFM image of produced Ferric Nano particles in this work. As it can be seen, grains, clusters and voids configure clearly.

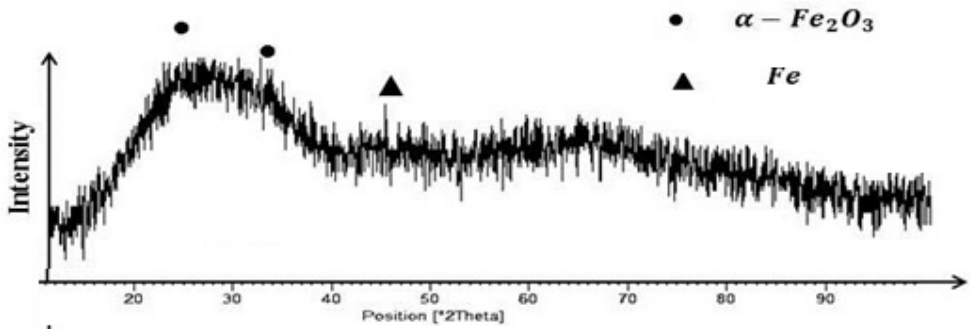

Fig. 1. XRD pattern of Ferric Nanoparticles deposited by CBD method.

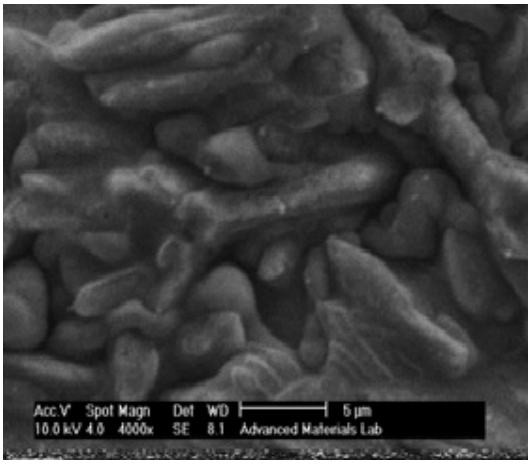

Fig. 2. The SEM image of Ferric Nanoparticles deposited by CBD method.

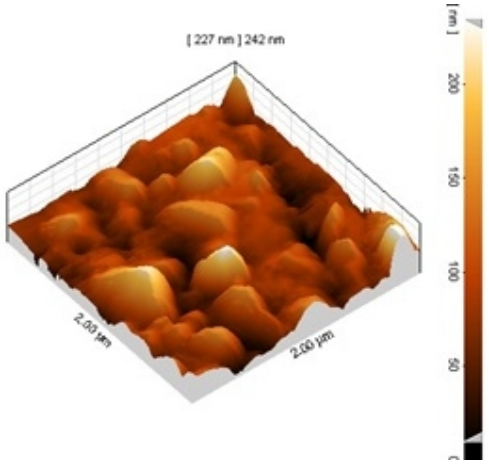

Fig. 3. The AFM graph of Ferric Nanoparticles deposited by CBD method.

CONCLUSIONS

Ferric Nanoparticles by the purpose of applying in medical physics and investigation about their effect on mental health, were produced by chemical method. Aqueous solution contains Iron chloride and thioacetamide and heated for 90 minutes as deposition time. Aqueous solution temperature for synthesis was about 75ºC temperature and kept at 10pH. Ferric Nanoparticles achieved from evaporated Aqueous solution in special oven at 250ºC temperature.

X-ray diffraction (XRD), Scanning electron microscopy (SEM), Atomic Force Microscopy (AFM) analysis proved the production of Ferric Nanoparticles. Nano particles have poly crystalline structure with bones like shapes by fraction of voids between them. Ferric Nanoparticles are one of the important components in medical and biological applications.

REFERENCES

Birkholz M, Lichtenberger D, Hfpfner C, (1992). Sputtering of thin pyrite layers. *Sol Energy Mater Sol Cells*, 1992, **27**: 243.

Bloch M, Rotenberg N, Koren D, Klein E. Risk factors for early post partum depressive

Leung BMY, Kaplan BJ. (2009). Perinatal Depression: Prevalence, Risks, and the Nutrition Link-A Review of the Literature. *J Am Diet Assoc*; **109**: 1566-1575.

Chatzitheodorou G, Fiechter S, Kfnenkamp R, (1986). Thin photoactive FeS_2 (pyrite) layers. *Mater Res Bull*, 1986, **21**: 1484.

Mathur S, Sivakov V, Shen H, (2006). Nano structured layers of iron,tin and titanium oxides by chemical vapor deposition. *Thin Solid Layers*, 2006, **502**: 88.

Sivako V, Petersen C, Daniel C, (2005). Laser induced local and periodic phase transformations in iron oxide thin layers obtained by chemical vapour deposition. *Appl Surf Sci*, 2005, **247**: 513.

Spinelli MG. (2004). Maternal infanticide associated with mental illness: prevention and the promise of saved lives. *Am JPsychiatry*;**161**:1548-1557.