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GROWTH MECHANISMS OF MgO NANOCRYSTALS VIA A SOL-GEL SYNTHESIS USING DIFFERENT COMPLEXING AGENTS

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ABSTRACT

MgO thin films have been prepared on substrates by a novel and simple sol-gel method using magnesium nitrate and collusion as starting material. The MgO nano catalyst with good sensor crystallization were obtained after annealing at 100°C Magnesium oxide was prepared by sol-gel method. The method involves the hydrolysis of magnesium alkoxide in the presence of acid or basic catalysts followed by a polyethylene glycol condensation reaction. The synthesized solids were characterized by IR spectroscopy X-ray diffraction electron microscopy, Ultraviolet visible absorbance measurement photoluminescence and Raman scattering spectra. sol gel irradiation the structure and morphology of the MgO particles were analyzed by XRD,These articles were used for FTIR spectroscopic measurement and spectra were collected, In EDS we calculated the peak intensity the SEM the images of metal oxide.

KEYWORDS: Magnesium Oxide, Sol-Gel method, SEM, FTIR, EDS.

I. INTRODUCTION

MgO is highly ionic insulating crystalline solid with structure which has excellent properties such as chemical inertness, electrical insulation, optical transpare high temperature stability, high thermal conductivity and secondary electron emission. Also, the microstructure of the deposited Film upon single-crystal substrates were investigated by X-ray diffraction (XRD), scanning electron microscope (SEM) and FT-IR micro stress and strain of the prepared films will be calculated. In the present investigation the sol gel method was adopted to achieve a homogeneous disperation of MgO and the effects of MgO on multization sinter ability & physical properties were investigated manganese works as luminescence centers in oxide& non-oxide materials, studies of green, orange, red phosphors containing manganese have been performed for a long periods. Magnesium oxide is a versatile oxide material with respect to its wide range of utilization such as in catalysis, hazardous waste treatment, anti microbial materials and refractory materials. Recently MgO has attracted tremendous attention on account of this immense application. Particularly in the field of catalysis, MgO has become promising materials in the roles of both catalyst and catalyst support in many organic reactions

II. MATERIALS AND METHODS

2.1. Materials

Sol Gel: The sol-gel process is a wet-chemical technique used for the fabrication of both glassy and ceramic materials. In this process, the sol (or solution) evolves gradually towards the formation of a gel-like network containing both a liquid phase and a solid phase [1]. Typical precursors are metal alkoxides and metal chlorides, which undergo hydrolysis and polycondensation reactions to form a colloid. The basic structure or morphology of the solid phase can range anywhere from discrete colloidal particles to continuous chain-like polymer networks.In materials science, the sol-gel process is a method for producing solid materials from small molecules. The method is used for the fabrication of metal oxides, especially the oxides of silicon and titanium. The process involves conversion of monomers into a colloidal solution (sol) that acts as the precursor for an integrated network (or gel) of either discrete particles or network polymers [2,3].

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2.2. Experimental procedure

Magnesium acetate tetrahydrate added with 150 ml ethanol stir with half an hour and added polyethylene glycol again stir with half an hour after stirring ageing overnight with 24 hours and dried at 100°C for 24 hours. After drying piston with 1 hour. It will form powder with white colour. Magnesium acetate tetrahydrate added with 150ml ethanol stir with half an hour and added oxalic acid again stir with half an hour after stirring ageing overnight with 24 hours and dried at 100°C for 24 hours. After drying piston with 1 hour. It will form powder with white colour. Nano sized of Magnesium Oxide (MgO) is an important oxide material that used in many applications such as gas sensor, catalysis supports, toxic wastes remediation, refractory materials and adsorbents. The commercial MgO particles have been prepared via thermal decomposition of Magnesium salts or magnesium hydroxide. The resulting MgO has large particle size and small surface area which are disadvantages for use in some applications, Therefore, Many synthesis methods have been developed to prepare MgO with large surface area with controlled morphology as reported in. However, the sol-gel method used is usually caused agglomeration of MgO particles, which hinder its wide applications .The controlled synthesis for MgO with specific morphology, small crystallite size and large surface area are challenging aspects to be studied. Magnesium acetate tetrahydrate added with 150ml ethanol stirred with half an hour and just added polyethylene glycol and once again stirred with half an hour and ageing overnight and dried at 100°C for 24hrs.

III. RESULTS AND DISCUSSION

3.1 SEM analysis

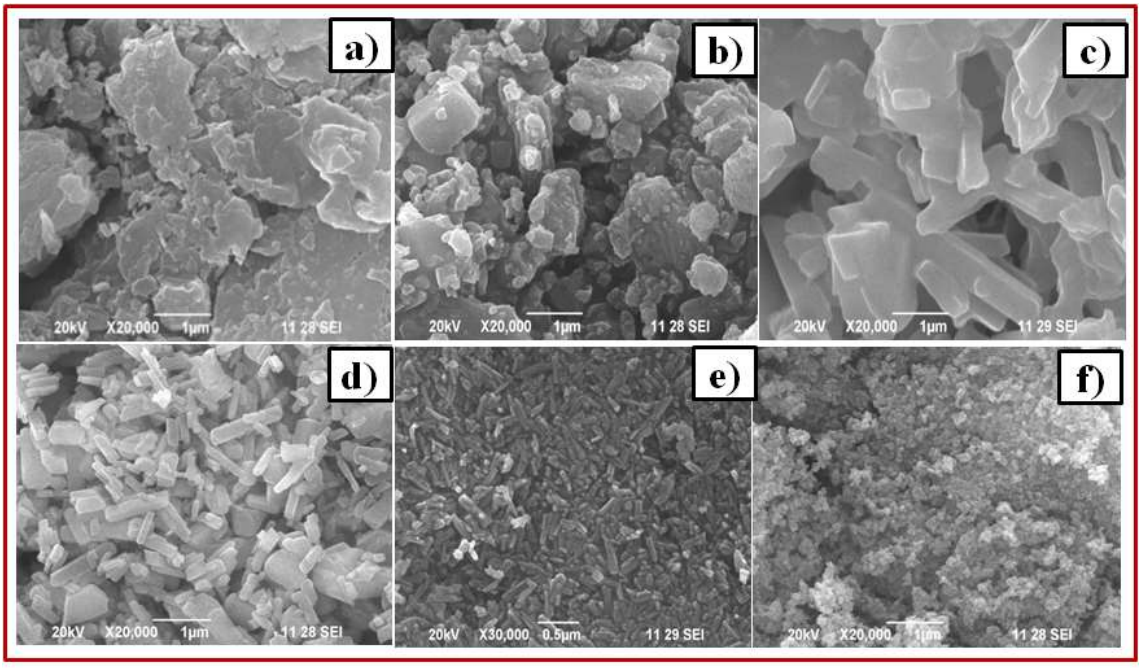

Fig.1. SEM images of (a) pure polyethylene at 100°C (b) without calcinations 100°C c) with calcinations 100°C (d) pure oxalic acid at 100°C (e) without calcinations 100°C (f) with calcinations 100°C

The SEM is a type of electron microscope capable of producing high resolution images of a sample surface [4]. Due to the manner in which the images is created, SEM images have a three-dimensional appearance and are useful for judging the surface characteristics and properties of a sample surface is easily read from the SEM images since the wavelength of electrons is very low compared to the EM wave, smaller areas are examined there by giving minute details-regarding the sample surface. Moving electrons have waves associated with them. Fig.1 shows the SEM images of MgO nanoparticles. It can be seen that different morphologies (nanoflake, spherical and rod shaped) was observed for PEG and oxalic acid assisted samples respectively. The average range of the particle for pure polyethylene glycol is 18nm [5]. And the average range of the particle for with calcination polyethylene glycol is 25nm. Similarly, the average range of the particle for without calcinations polyethylene glycol is 28nm. Morphology of the Mgo particles is in nanoscale range [6]. Due to sol gel method, the sizes of these particles are in the range (Fig. 2 d). The average range of the particle for with pure oxalic acid is15 nm (Fig. 2 e). The average range of the particle for without calcinations oxalic acid is 16nm [7]. The

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average range of the particle for with calcinations oxalic acid is 22 nm. The Morphology of the Mgo particles is in nanoscale range [8]. The Morphology is round and sphere. The pure oxalic acid Morphology is rod like structure.

3.2. EDS analysis

Energy Dispersive X-Ray Analysis (EDAX), referred to as EDS or EDAX, is an x-ray technique used to identify the elemental composition of materials [9]. Applications include materials and product research, troubleshooting, deformulation, and more [10]. EDAX systems are attachments to Electron Microscopy instruments (Scanning Electron Microscopy (SEM) or Transmission Electron Microscopy (TEM)) instruments where the imaging capability of the microscope identifies the specimen of interest [11]. Fig.2. EDS spectra of MgO nanoparticles. The Mgo present in polyethylene glycon at 100°C

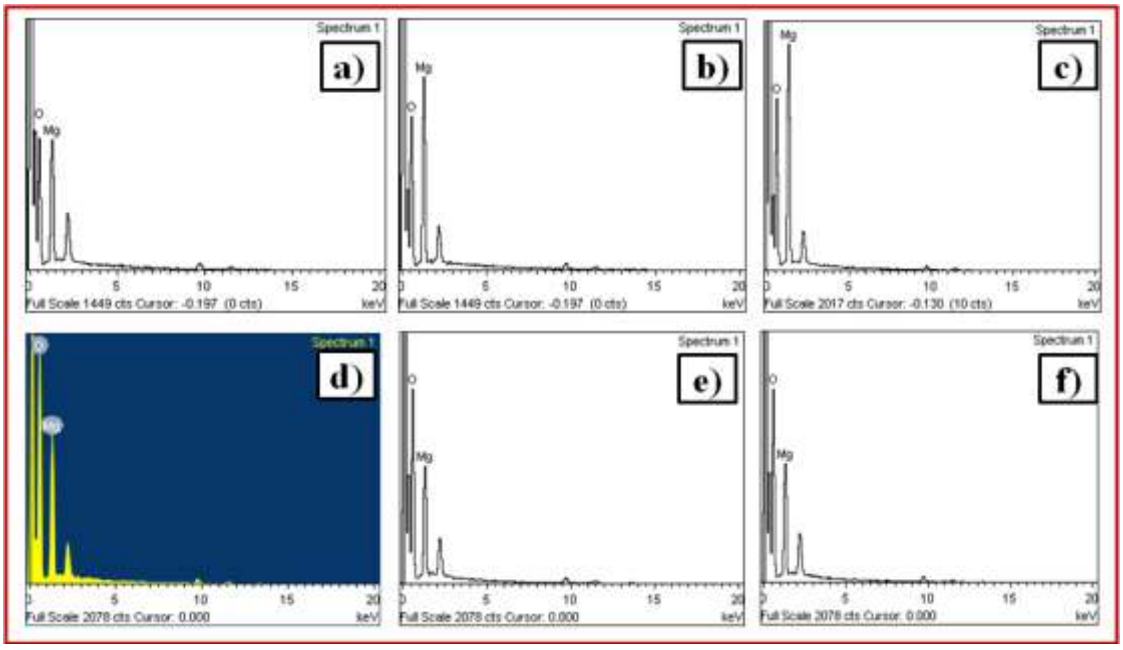

Fig.1. EDS spectra of (a) pure polyethylene at 100°C (b) without calcinations 100°C c) with calcinations 100°C (d) pure oxalic acid at 100°C (e) without calcinations 100°C (f) with calcinations 100°C

3.3. FTIR spectra analysis

FTIR is a technique which is used to obtain an infrared spectrum of absortion. Emission, Photoconductivity or Raman scattering of a solid, liquid or gas[12]. An FTIR spectrometer simultaneously collects spectral data in a wide spectral range. This confers a significant advantages over a dispersive spectrometer which measures intensity over a narrow range of wavelength at a time[13] .FTIR has made dispersive infrared spectrometers all but obsolete(expect sometimes in the near infrared),opening up new applications of infrared spectroscopy[14]. Infrared (IR) is the name given to the range in the electromagnetic spectrum between visible light and microwave radiation, conventionally from ca. 0.8 μm to 1 mm wavelength (12,500–10 cm–1)[15]. Thin insulation leads to the densities of the MgO insulated samples and uncoated compacts to be close to each other.Also the nature of the insulating layer can be assessed by FTIR analysis The IR spectrum of MgO was recorded with a BRUKER [16-18].Fourier transform Infrared spectrometer in the range of 600-4000cm-1.The observed spectrum of synthesized MgO is present in Fig. (a and b)corresponding to samples prepared with PH values respectively[19].The strong absorption peaks in the metal-oxide vibrations. Thus can be correlated to Mg-O vibrations[20].The Mg-Ovibrations around 890cm-1 are in agreement with the earlier reports.

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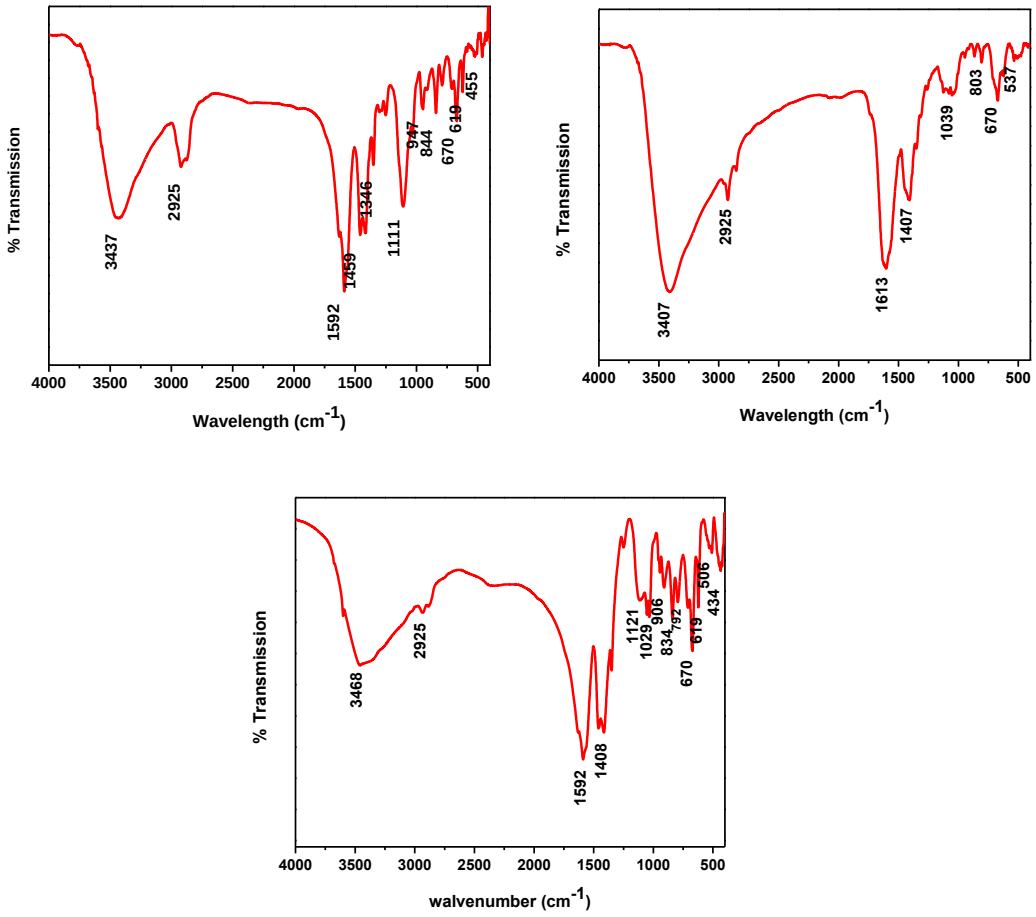

Fig.4. FTIR spectra of (a)pure polyethylene at 100°C (b)without calcinations at 100°C (c)with calcinations at 100°C

IV. CONCLUSION

EDS and X-ray analysis, FTIR spectra and density measurements showed that the particles surface layer contained a MgO insulating layer with uniform coverage of the powder surfaces after sol-gel processing. The MgO worked effectively on band gap engineering irrespective structure. In this work, the sol-gel methods for heat treated soft magnetic composites with a thin MgO insulation layer. MgO insulating has higher thermal stability than polyethylene glycol. The produced nanostructure particles were characterized to determine particle size distribution, surface properties. It is well known that various factors, such as crystalline size, morphology. Furthermore the nano structure particles can be easily produced through sol gel method technique in one step, whereas it is unable with sol-gel method that this conditions influences production cost. The importance of the present articles lies is establishing that MgO supports can be obtained by the sol-gel method. The effects of these MgO supports on catalytic activity will be dealt with in future work.

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