Physical Properties of Lead Arsenate Glass System

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Abstract: My Present work is lead arsenate composite material ions, study the properties of the pbo As₂O₃ glass system doped with Transition metal ions, scanning electron micros copy, EDS, X-RD and Optical absorption peaks readings wave length ragneis 300-1200 nm for identification of various electronic transitions metal ions. Lead Arsenate pure glasses doped with various composites of iron ions were preserved. study the samples characterized by XRD studies and SEM studies reveal the existence of (Fe₃Pb)As₂O₅ glasses points are also detected. The optical absorption bands of this glass have presented 3 absorption peaks on 670,860nm, the observed gradually growth trend the strength of the peaks due to Fe²⁺ transition ions at the expenditure of the peaks due to Fe³⁺ transition ions up to 0.6 mol%. The amorphous Fe₂O₃ glasses in the range of frequency 10⁷ Hz to 10⁹ Hz and temperature is 77 k to 450 k.

Keywords: Glass Preparations, SEM, EDS, XRD and Optical absorption

I. INTRODUCTION

The metal ions like iron melted in pure glass matrix even in very small amounts: Affect the protecting character of these glasses very powerfully. The adding of iron to lead niobium phosphate glasses is estimated to grow the chemical stability and to fall the decomposition rate in aqueous surroundings [1]. iron have heavy-duty behavior on different material goods of glasses. A bulksum of excitingreadings are presented on the surroundings of Fe ion in various inorganic composites vice versa., SiO, BO₃·₃P glasses [2-11] and also tellurite glass system [12,13]. The ions are exists altered filled with holes states with altered coordination in glass conditions, for examples as Fe³⁺ transition ions polyhedron having four plane faces and polyhedron having eight plane faces and as Fe²⁺ transition ions polyhedron having eight plane faces surroundings [14, 15]. TheFe²⁺ andFe³⁺ transition ions are wellknown paramagnetic ions. Fe²⁺ ion has a bulky magnetic anisotropy due to its strong spin-orbit interaction of the 3d orbital where as such anisotropy energy of Fe³⁺ transition ions is small The current investigation is at an understanding the catalytic agentact of the iron ion on the representation of PbO-As₂O₃ glass system by means of different analytical techniques.

1. F₁: 40PbO-60As₂O₃: 0.2 Fe₂O₃ Composite Glass System
2. F₂: 40PbO-60As₂O₃: 0.4 Fe₂O₃ Composite Glass System
3. F₃: 40PbO-60As₂O₃: 0.6 Fe₂O₃ Composite Glass System

II. EXPERIMENTAL STUDIES

1. EXPERIMENTAL STUDIES

1.1 Glass Preparation

The studies of the Pbo-As₂O₃-X Fe₂O₃, x values are taken from 0, 0.2, 0.4 and 0.6 mol%.

1. F₁: 40PbO-60As₂O₃: Pure Glass System
2. F₁: 40PbO-60As₂O₃: 0.2 Fe₂O₃ Composite Glass System
3. F₂: 40PbO-60As₂O₃: 0.4 Fe₂O₃ Composite Glass System
4. F₃: 40PbO-60As₂O₃: 0.6 Fe₂O₃ Composite Glass System

[15-18], the materials used for the groundwork of the present glasses were analytical grade reagents pure glass of Lead Arsenate. The composites of requisitarrangements were carefully mixed in an agate mortar and heated in a platinum crucible. The heater used was a high temperature controlled heater(fig1). The glasses wereheated up to 550°C- 650°C for thirty minutes till a bubble free liquid was formed. The samples were next hardened at 300 °C in additional heater. The resultingsoften was discharged on a rectangular brass mouldheld at room temperature. The sample ground and optically polished. The estimated final measurements of the glasses used for studying the physical assets are 1cm×1cm×0.2cm.
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1.2 Crystallization Techniques
For crystallizing the glass samples containing different collections of Fe2O3 heat treated in an spontaneous regulatory heater at 400°C for four hours. After the heat treatment the models were extinguished in air to room temperature.

1.3 Physical Properties
The compactness of the crystallization glass is located resolute by the normal principle of Archimedes ‘the floating liquid. A straight evaluation balance for weighting. Majority glasses are adjourned on a very tinny copper strand was set in the involvement fluid bowl and weighed in the liquid and air. Using compactness and normal molecular weight other parameters such as Fe ion collection N, the polar on range, etc., of the glasses are evaluated.

1.4 Optical Absorption bands
The absorption bands are lead and arsenate pure and glass ceramics be present verified using a Spectrometer wavelength is 250-1500 nanometers. The light rays entered the slitto light source (Ultra Violet ) is replicaled by the glass M, and absorbed in to the single source. The D2 is used as a source from two hundred nm to source converting and W, (VISIBLE) from source convertingA,1100nm, there are exchanged spontaneously according to the λ range. The position light source mechanically exact for supreme sensitivity and the source condenser mirror is positioned outside the source housing so as not to be exposed to heat rays and ozone. All the optical elements excluding the source are sealed from the external atmosphere by the window plate W so as to be dust free. The slit width of the monochromatic fixed at 2nm. The beam coming from the monochromatic is passed from side to side the stray-light cut off F, reflected by glass M, and then split by the1/2 glass M, into the sample and reference beams. Each beam passes through the respective cell to photo diode detector. [fig3]. In the electrical system of the spectrometer, the main control element is a microcomputer Control Processing Unit which controls the light source lighting, and switching filter converting λ scan, presentation, control panel & copier.

| Sl.N o. | property | glass F0 | glass F1 | glass F2 | glass F3 |
|--------|----------|----------|----------|----------|----------|
| 1      | Compactness \((g/cm^3)\) | 6.125     | 6.437     | 6.489     | 6.497    |
| 2      | \(\overline{M}\) | 208.9     | 208.8     | 208.7     | 208.6    |
| 3      | \(N_1\times10^{21} \text{ions/cm}^2\) | -         | 4.21      | 7.38      | 8.28     |
| 4      | \(R_2(A^2)\) | -         | 5.821     | 4.393     | 3.911    |
| 5      | polram radius \(R_p(A^3)\) | -         | 2.75      | 2.17      | 1.15     |

Fig – 1 Diagrammed of atmosphere-controlled furnace.

Fig – 2 optical system of the spectrophotometer

Fig. 2.3 electrical system of the spectrophotometer

III. RESULTS

1 Physical Properties
Study the standards of compactness \(d\) and deliberate \(M\), several parameters such as Ni and \(R\), of the glass ceramics are estimated using the formulae [6].

Table -1 PbO-As2O3- Fe2O3 glasses physical parameters.
2 XRD Analysis
The XRD of the PbO-As2O3 glasses (fig 3.1) crystallized at 400°C doped with different collections of nucleating proxy iron ions designated that the composite samples involve PbFe4As2O11 and PbAs2O6 crystal points along with the PbO-As2O3 crystal points. The glass ceramics exist the Fe3+ and Fe2+ states.

1.5 SEM & EDS
The SEM pictures some of the crystalized samples (fig 3.2). Scanning electron microscope pictures of the crystallized samples display well-known and unsystematically dispersed crystal ingrained in smooth matrix. The compound powder and paint of the samples in shown in fig (3.3). The Energy Dispersive Spectroscopy examination of the composite materials displays lead, Arsenat and Fe elements in various crystal-like phases. (Fig 3.4). X-Ray charts specify the practically equal arrangement of Fe ions in the entire composite materials.
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Fig. 3.3 (d) EDS glass ceramic sample F2

Fig. 3.4 PbO-As2O3:Fe2O3 X-Ray mappings.

3.4 Optical Absorption bands

The absorption peaks (fig 3.5) all the PbO-As2O3: Fe2O3 glass ceramics verified at room temperature has displayed three absorption peaks at about 670, 560 nanometer; this peaks are recognized in line for Fe3+ transition. Moreover a peak at 900 nm, recognized due to Fe2+ [19] is also sited in the spectra. With growth in the doped Fe collection of up to 0.6 molar percentage the strength of peaks due to Fe2+ transition is perceived to growth; when the attentiveness of Fe2O3 is raised elsewhere 0.3 molar percentage a continuing reduction in the strength of the peaks due to Fe2+ transition could visibly be detected while that of band due to Fe3+ transition is observed to increase.

Table-2 PbO-As2O3 glass ceramics optical absorption peaks

| Sl.No | Fe3+ transitions (nm) | Fe2+ transitions (nm) |
|-------|-----------------------|-----------------------|
|       | A1 (t2g2ē2g) → a1T2g(1a1g) | A1 (ē2t3g) → a1T1g (1a1g) |
| 1     | 560                   | 670                   |
| 2     | 560                   | 670                   |
| 3     | 560                   | 670                   |
| 4     | 560                   | 670                   |
| 5     | 560                   | 670                   |
| 6     | 560                   | 670                   |

Fig. 3.5 Optical absorption peaks of PbO-As2O3: Fe2O3 glass ceramic samples.

IV. CONCLUSION

The main study of physical properties of crystallized (40-X) PbO-60As2O3: X Fe2O3 glasses are summarized below.

1. The developing of take shape Fe2O3 causes a minor increase in the compactness of PbO-As2O3: X Fe2O3 glasses; the suggestive of increasing structural compression of the material.

2. The XRD of the crystalized lead arsenate pure glasses doped with different collections of nucleating proxyiron ions designated that the composite samples involve PbFe4 (As2O11), Fe2O3:n Pba2O4 component points along with the PbO-As2O3 crystal points. The glass ceramics exist the Fe3+ and Fe2+ states.

3. The SEM pictures the crystalized samples PbO-As2O3: Fe2O3 glasses display well known and systematically dispersed crystals ingrained in smooth matrix.

4. Energy Dispersive Spectroscopy examination of the pure & composite materials displayed lead, Arsenat and Fe elements in different crystalline phases X-Ray maps indicate the realistically equal arrangement of Fe ions in the entire composite materials.

5. The optical absorption peaks of all the PbO-As2O3: Fe2O3 glass composites verified at...
room temperature has displayed three absorption peaks at about 670, 560 nanometers; these peaks are recognized due to Fe$_{3}^{3+}$ ions. Moreover a peak at 900 nm, recognized due to Fe$_{2}^{2+}$ ions is also situated in the peaks. With growth in the doped Fe collection of up to 0.6 mol% the strength of peaks due to Fe$_{2}^{2+}$ transition are perceived to growth; when the collection of Fe$_{2}^{2+}$O$_{2}$ is higher elsewhere 0.3 moll percentage a continuous reduction in the strength of the peaks due to reason the Fe$_{2}^{2+}$ transition could be perceived while that of band due to Fe$_{3}^{3+}$ transition is observed to growth.

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