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Synthesis and Structural Characterization of Mg2SiO4 Nano Particles

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ABSTRACT

Mg2SiO4nanomaterial was synthesized using combustion method with metal nitrate as precursor and ODH as fuel. The powder X-ray diffraction (PXRD) patterns of the as-formed products show single orthorhombic phase and no further calcination was required. The crystallite size was obtained using Scherer's formula and was found to be 25-30 nm.

Keywords : Combustion, Characterisation

I. INTRODUCTION

Nanotechnology has pulled in a few investigates from the luminescence field. Nanophosphors contrast from existing bulk materials as far as its electrical and optical attributes because of quantum size effect and this impact is brought about by an expansion in the band gap because of a reduction in the quantum permitted express that exists in little particles and the high surface to volume proportion which improves the surface and interface impacts.Silicate family is an appealing class of materials among inorganic phosphors for wide scope of uses because of their unique properties, for example, water, compound obstruction and unmistakable light straightforwardness. In silicate family, the Mg2SiO4 have material called as Forsterite when doped with uncommon earth particles shows some fascinating applications, for example, durable phosphors, X-beam imaging, shows (LED), ecological observing, unadulterated shading outflow and so forth.Forsterite (Mg2SiO4) crystalline nanophosphor belongs to olivine family of crystals with orthorhombic crystalline structure in which Mg2+ occupies two non equivalent octahedral sites : one (M1) with inversion symmetry (CI) and the other (M2) with mirror symmetry(CS). Synthesis of silicate phosphors can be done in different methods such as solid state reactions, sol-gel, hydrothermal, precipitation, combustion synthesis, etc. Among all methods low temperature combustion synthesis (LCS) route is the best suitable technique because it gives high degree of homogeneity, short reaction time that leads to reduction in crystallization temperature and prevents from segregation during heating [1-3]. Eu3+ doped phosphors can be adequately energized by N-UV and blue light, and make a solid red emanation which credits to 4f–5d advances which include wide ghostly line width as happened for low valence uncommon earth particles are gem field related and can be tuned by the size and the precious stone structure [4-6]. In this paper we report on low temperature amalgamation, basic portrayal of Mg2SiO4.

II. EXPERIMENTAL

The fuel oxalyl dihydrazide (ODH) (C2H6N4O2) was set up in our research center by the response of diethyloxalate with hydrazine hydrate [7-8] as depicted in the writing. Watery arrangement containing stoichiometric measures of analar grade magnesium nitrate, seethed silica and research facility arranged ODH are taken in a Petri dish of 300 ml limit. The arrangement were mixed well utilizing attractive stirrer and afterward the petridish is brought into a stifle heater kept up at low temperature i.e 350±10 ◦C. The ignition happens all through the response blend with the freedom of oxides of nitrogen and carbon inside a brief timeframe of ~5 min.

III. RESULTS AND DISCUSSION

The PXRD patterns of the as-formed combustion derived Mg2SiO4 sample was shown in Fig 1. The pattern is well matched with the JCPDS card number 78-1372. The crystallite size (D) of Mg2SiO4 sample was calculated using Debye- Scherer's formula and W-H plot [9]. The crystallite size is found to be ~25 nm.

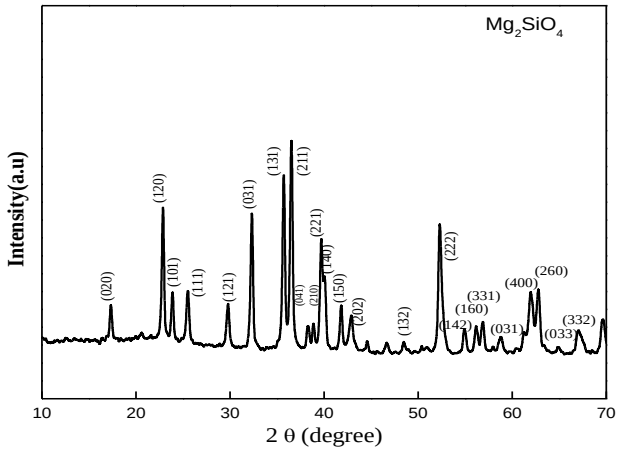

Fig. 1. PXRD pattern of Mg2SiO4.

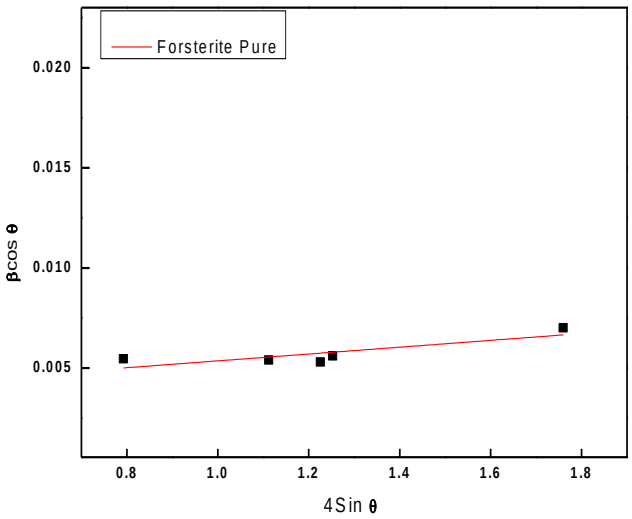

Fig. 2. W-H Plot of Mg2SiO4.

The room temperature infrared spectra of Mg2SiO4sample is recorded in the range 300–4000 cm–1 utilizing KBr pellets is appeared in fig 3.The peaks at 420, 525, 620, 680, 880, 1020, 1250 and 1384 cm–1 are alloted to MgO6 octahedral, Si–O, Si–O (twisting), Mg–O, Si–O (extending), (CO and Si–O), C–H and NO3 separately [11].

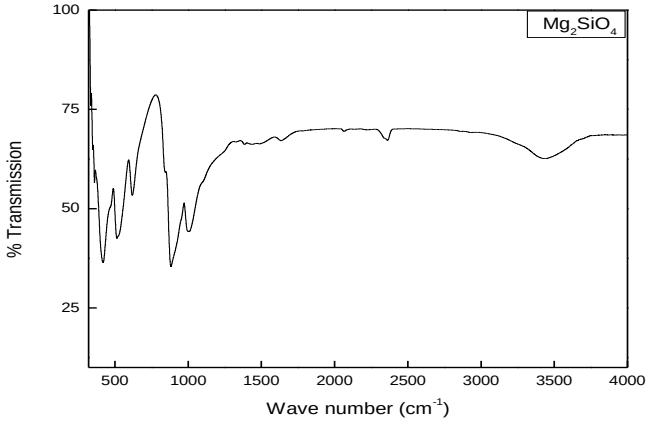

Fig. 3. FTIR of Mg2SiO4

IV. CONCLUSION

Mg2SiO4 nanoparticles are prepared using solution combustion method with a crystallite size 25-50 nm. FTIR spectrum confirmed stretching and bending modes of the sample.

V. REFERENCES

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