Supporting information

Crystallographically altered $(Mg, Sr)_3(Al, Ga)_2GeO_8$: Cr^{3+} phosphors with tuned emission width from ultra-sharp red to profound NIR band

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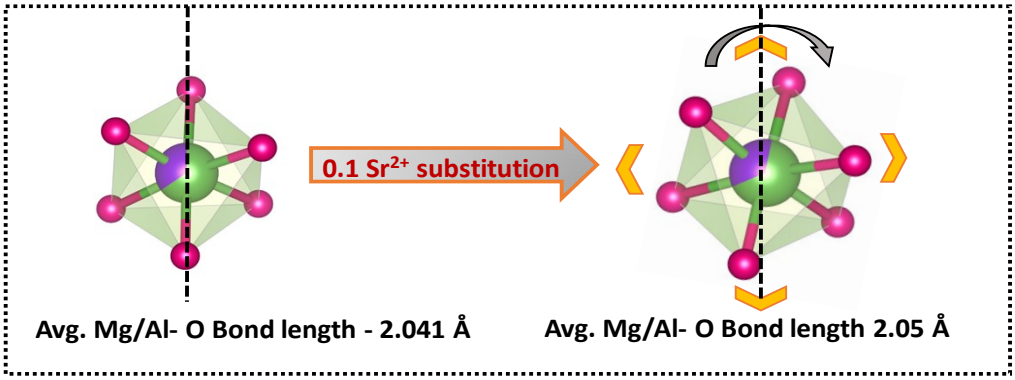

Figure S1. Schematic representation of structural distortion in [$(Mg/Al)O_6$] octahedrons after Sr^{2+} ions' doping

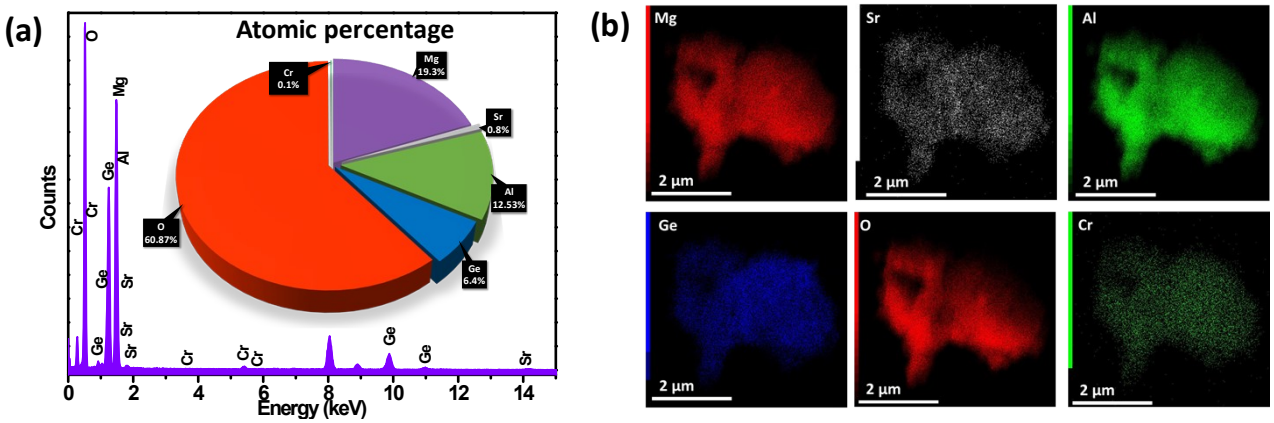

Figure S2. (a) The EDX spectra and **(b)** EDX elemental mapping of Mg, Sr, Al, Ge, O and Cr for MAG: Cr^{3+}, $0.1Sr^{2+}$ sample.

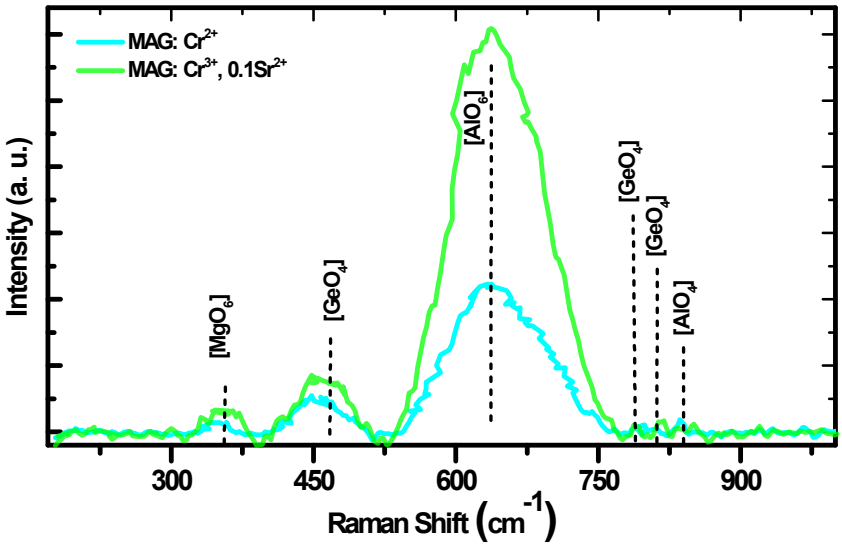

Figure S3. Raman spectra of MAG: Cr^{3+} and MAG: Cr^{3+}, $0.1Sr^{2+}$

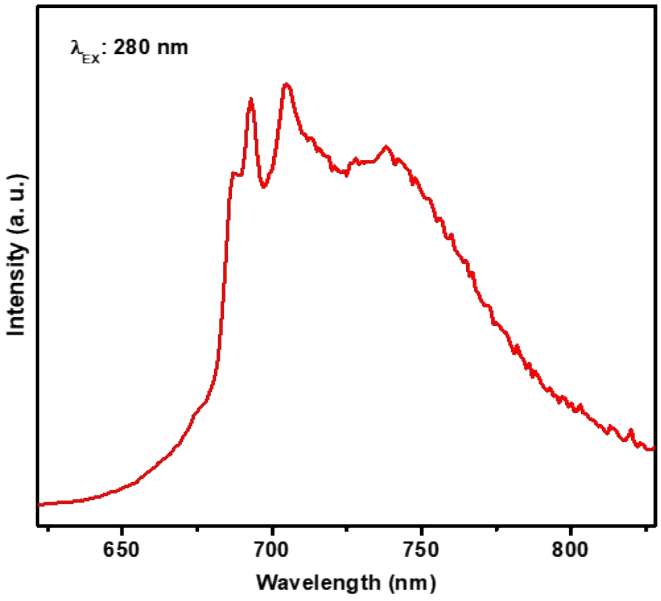

Figure S4. PL emission spectra of MAG: Cr^{3+}sample for under 280 nm excitation.

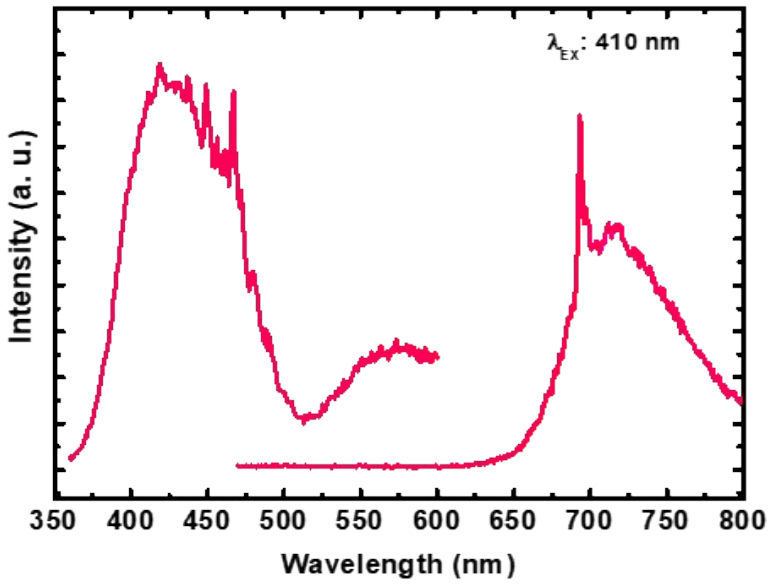

Figure S5: PLE and PL emission spectra of $SrMgGe_2O_6$: 0.01 Cr^{3+} sample.

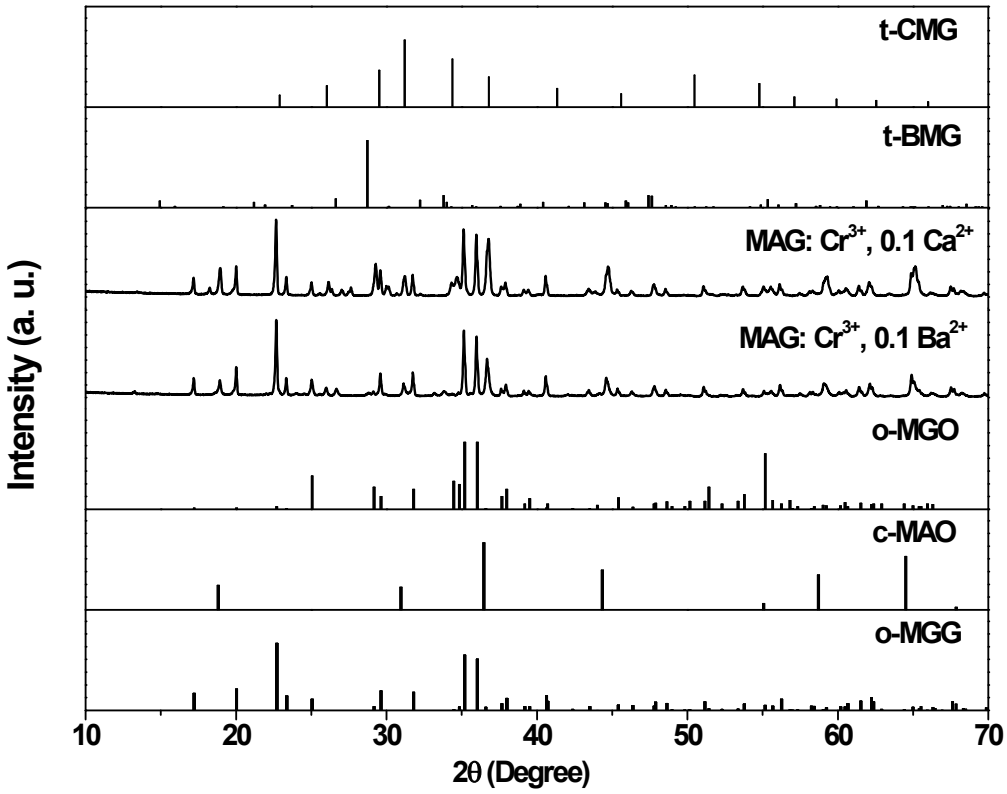

Figure S6. XRD patterns of the MAG: Cr^{3+},0.1Ba^{2+} and MAG: Cr^{3+}, 0.1Ca^{2+}

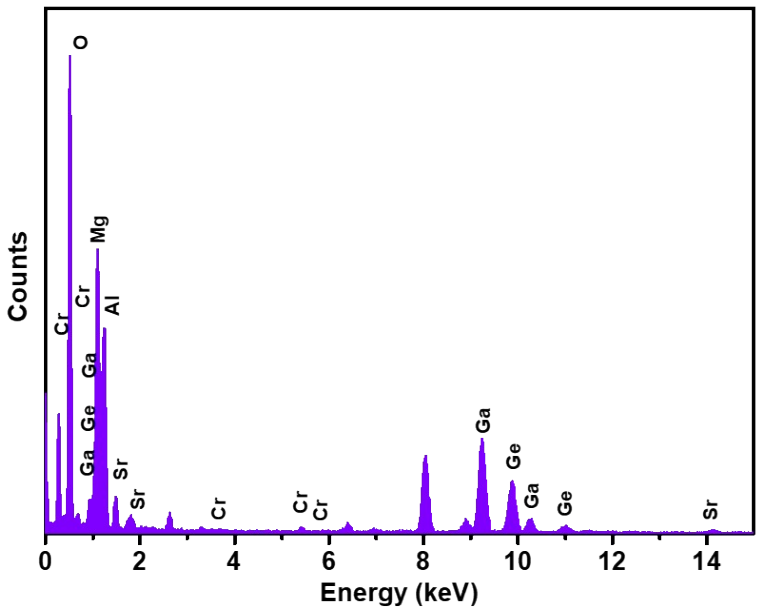

Figure S7. The EDX spectra of MAG: Cr^{3+}, 1.5 Ga^{3+}, 0.1Sr^{2+} sample showing the presence of Mg, Al, Ge, Ga, Sr and Cr elements in the sample.

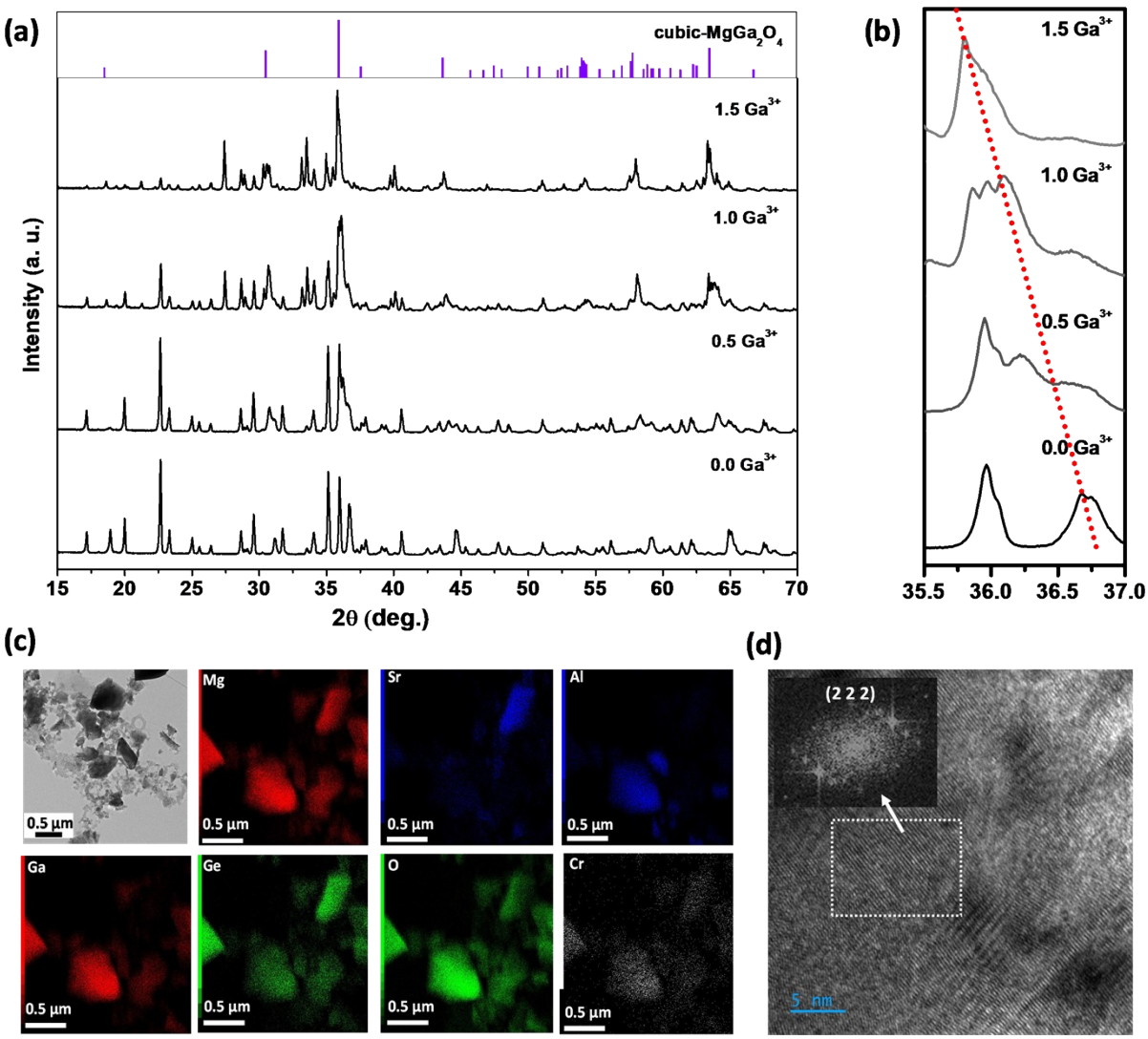

Figure S8 (a) Powder XRD patterns of MAG: Cr^{3+}, $0.1Sr^{2+}$, yGa^{3+} (y = 0.0 to 1.5) samples and **(b)** enlarged portion of XRD pattern from 35.5º to 37º. **(c)** TEM image and EDX elemental mapping of various elements in MAG: Cr^{3+}, $0.1Sr^{2+}$, $1.5Ga^{3+}$ sample. **(d)** HRTEM image showing the lattice planes of MAG: Cr^{3+}, $0.1Sr^{2+}$, 1.5 Ga^{3+} sample and the r-FFT of a small portion.

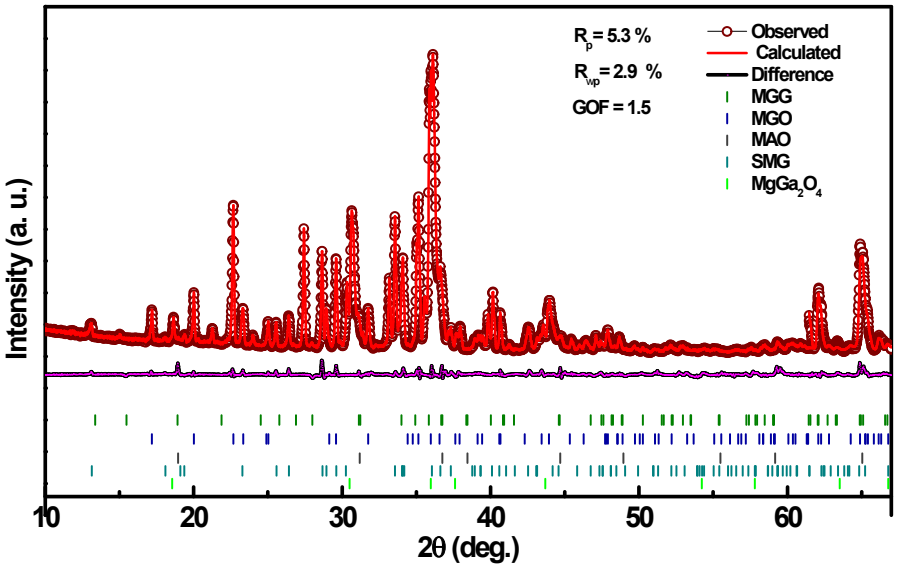

Figure S9. Refinement pattern of MAG: Cr^{3+}, $0.1Sr^{2+}$, 1.0 Ga^{3+} sample

Culturing of cells

Hela (Human cervical cancer) cells were procured from National Centre for Cell Sciences (NCCS), Pune. Cells were cultured in Minimum Essential Media (MEM, GIBCO) supplemented with 10% Fetal Bovine Serum (FBS, Gibco) and 1% antibiotic antimycotic solution 100X (with Penicillin, Streptomycin and Amphotericin B-Himedia) and incubated at 5% CO_2 at 37°C in the incubator.

Assessment of cell viability

Single-cell suspension of HeLa cells was prepared and seeded in the flat bottom 96 well micro titre plates (1×10^4 cells/well) and was kept at 5 % CO_2 & 37 ºC for 24 hours. Then, MAG: Cr^{3+}, $0.1Sr^{2+}$ phosphor was supplemented to the cells at variable concentrations ranging from 0-100 µM in serum-free culture medium and further incubated for 24 hours. Afterwards, the compound containing the culture medium was removed and the wells were rinsed with PBS. MTT (3-[4,5-dimethylthiazol-2-yl]-2,5-diphenyltetrazolium) reagent (0.5 mg/mL) was prepared in Hanks balanced Salt solution (HBSS) and added to each well including the untreated control wells and kept in dark for 4 hours. The insoluble formazan crystals formed were dissolved in DMSO and the absorbance (Abs) was measured colorimetrically at 570 nm in a multimode plate reader (Synergy H1, Biotek) (2). Percentage cell viability was calculated using the formula.,

% Cell viability = [Absorbance of sample/ Absorbance of control] x 100

Cellular internalization studies

To evaluate the cellular internalization pattern of MAG: Cr^{3+}, $0.1Sr^{2+}$ phosphor, HeLa cells were seeded in a flat bottom 96 well plate at a seeding density of $7x10^3$ cells per well. After 24 hours of incubation, these cells were treated with a non-cytotoxic concentration (25 μM) of the compound for 5 hours. Further, the wells were rinsed with PBS and visualised with the red channel filter (TRIT-C) of fluorescent microscope. In order to perform the concentration based internalisation studies, varying concentrations of MAG: Cr^{3+}, $0.1Sr^{2+}$ phosphor (10, 25 and 50 μM) was added to the cells and incubated for 5 hours, rinsed with PBS and fluorescence images were acquired. Similarly, time dependent internalisation pattern was also recorded by imaging the cells treated with 25 μM of MAG: Cr^{3+}, $0.1Sr^{2+}$ phosphor from 1 hour to 5 hours. Fluorescent intensity profile was created using ImageJ software.