NEAR INFRARED EMISSION OF RARE EARTH AND CHROMIUM STRONTIUM ALUMINATES UNDER UV, VIS AND NEAR INFRARED EXCITATIONS

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Abstract

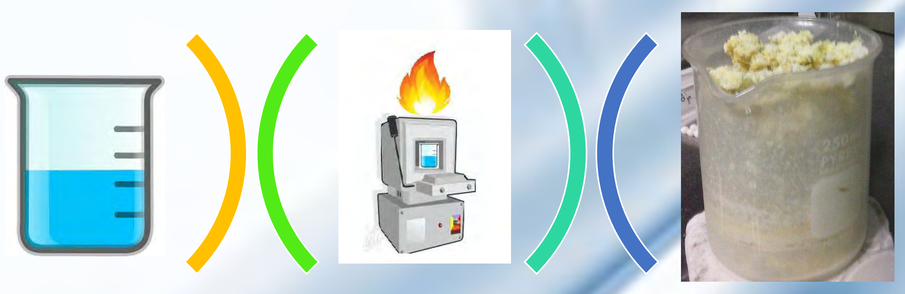
In the present work nanocrystalline doped strontium aluminates have been studied for its remarkable emissions in the near infrared (NIR) range (700-1600nm) under excitation in the UV, Visible, and NIR range. Nanophosphors were synthesized by a simple combustion method, and have been doped with rare earths such as Erbium, Europium, and Neodymium, as well as with chrome. The structural characterization was performed by DRX. Photoluminescence characterization was performed both in the visible region as well as in the NIR. These phosphors present intense emission bands in 700-900 nm, 1200-1400nm, and 1400-1600nm, corresponding to the emissions of Cr3+, Nd3+ and Cr4+, and Er3+, respectively; such emissions open a window for biological applications, due to the fact that they present emission where the biological tissues present a minima of absorption in the NIR range. Besides that it is possible to excite these phosphors in the 700-1000nm range, where there is again a minimum of tissue absorption.

INTRODUCTION

The interest to produce emitting materials in the NIR is due to the applications they present in the field bio and thermometry, to mention a few.
The use of NIR emitting photons is more suitable for biomedical imaging and detection that that of ultraviolet (UV) or visible.
In this work we present the study of the structural and optical properties of $SrAl_2O_4$ and $Sr_4Al_{14}O_{25}$ using different concentrations of Eu, Er, Nd, Yb and Cr.

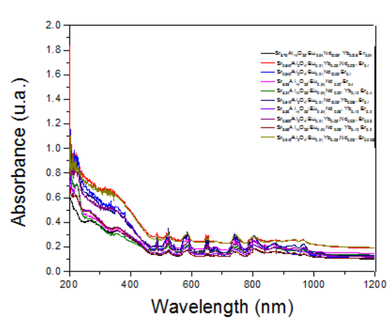
EXPERIMENTAL SECTION

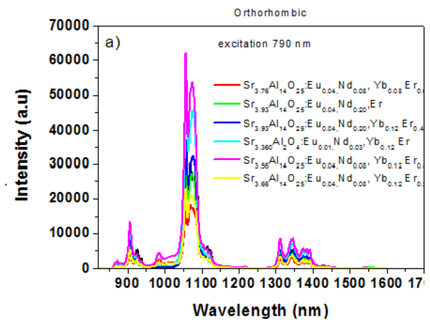
The strontium aluminates were made by combustion using nitrate precursors AlNO3, SrNO3 and other reagents as H3BO3, NH4NO3. Then the nitrates, urea (fuel), H3BO3 and NH4NO3 were added to an aqueous solution until completely dissolved. The mixture was placed in a muffle at 600 ° C where combustion occurred. Finally a low density foam is obtained.

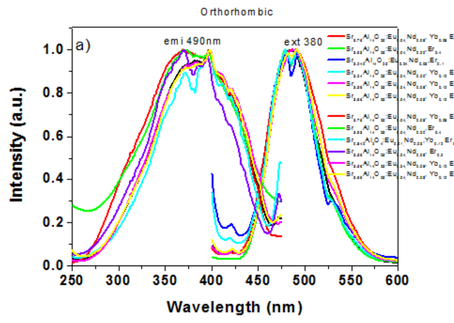


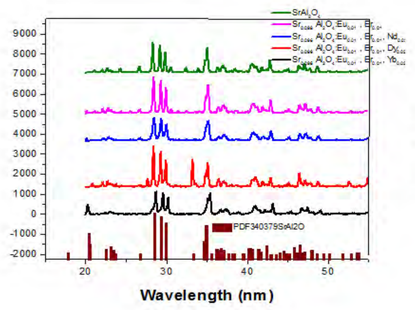
The samples with the different rare earth doping samples were annealing at 1150C for 6 h.
Absorption and photoluminescence (λex= 405, 520, and 976 nm) spectra were recorded in a CARY 5000 UV-visible-NIR, and ActonSpectra Pro 2150i spectrophotometers respectively.

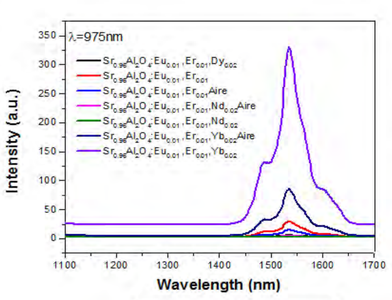
RESULTS

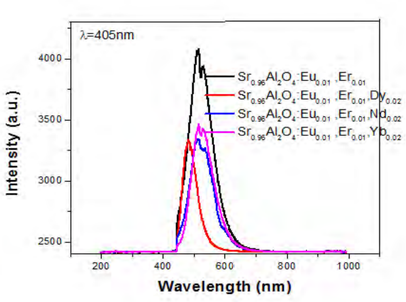


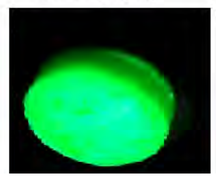


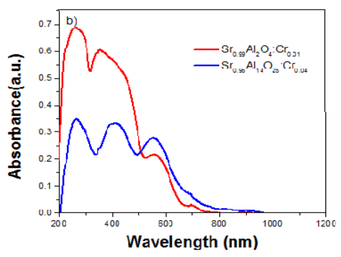


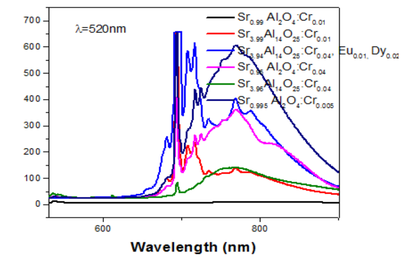


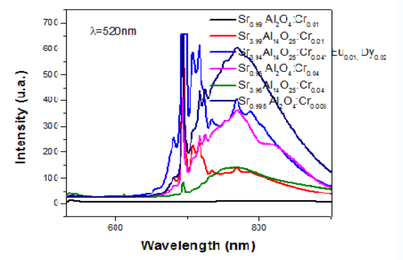


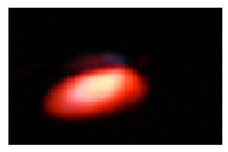












CONCLUSION

The synthesis of strontium aluminates have been successfully synthesized obtaining different emission in the range NIR and VIS by changing the molar ratio between the precursors.

REFRENCES

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