Synthesis and characterization of the optical properties of the TTA/Gd_2O_3: Eu^{3+} system.

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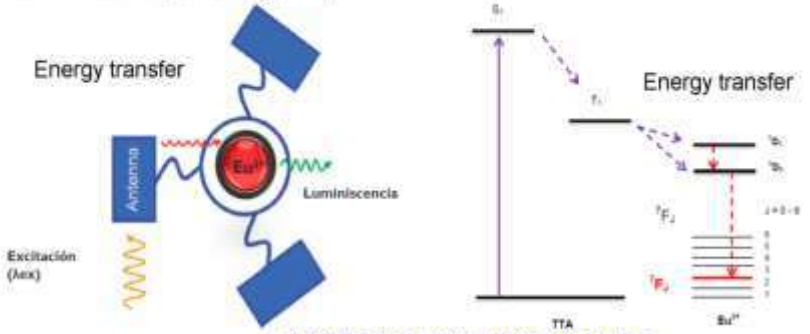
RESUMEN

Luminiscent powders of (TTA = Teoniltrifluruoacetona) TTA/Gd_2O_3: Eu^{3+} were synthesized by sol-gel method, the luminescent properties were increse in comparation whith organic (TTA:Eu^{3+} 5% mol) and inorganic (Gd_2O_3: Eu^{3+} 5% mol) the TTA molar ratio was varied TTA:Gd_2O_3: Eu^{3+} X:1:0.05 (X=0.08, 0.16, 0.32 y 0.64) mol. To acquire the sistem TTA/Gd_2O_3: Eu^{3+} first able were synthesized Gd_2O_3: Eu^{3+} nano powders in presence of Pluronic F-127 as surfactant in order to increase the luminescent intensity. The precursors gadolinium nitrate ($Gd(NO_3)_3$, 99.9% Sigma Aldrich), Europium nitrate (Eu $(NO_3)_3$, 99.9% Sigma Aldrich), and ethanol (EtOH, CH_3CH_2OH, 99.9%, Fermont) were used. The resulting powders were dispersed in etanol by ultrasonic bath , and finally, the solution of Teonyltrifluruoacetone (TTA) was aggregate into the sol whit the appropriate proportions. The luminescent powders obtained from the TTA/Gd_2O_3: Eu^{3+} system were washed to remove the excess of TTA, and the resulting product was dried at 80°C Structural analysis was carried out by X-ray diffraction (XRD), optical properties by photoluminescence (FL), morphological analysis by using scanning electron microscopy (SEM) and chemical properties by means of Fourier transform infrared spectroscopy (FTIR).



INTRODUCCIÓN

The luminescence of rare earths has been of great interest in recent decades due to the application in optoelectronic devices and the use of inorganic matrices to increase their luminescent intensity.

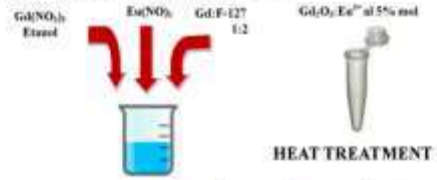
The application of organic to grown in the last decades obtaining luminescent powders with high intensity due to the energy transfer of the "antenna effect".

New inorganic-organic materials arise in response to the need to increase the luminescent properties for their application in optoelectronic devices.

EXPERIMENTAL PROCEDURE

Synthesis Gd_2O_3:Eu^{+3} al 5% powders whit F-127

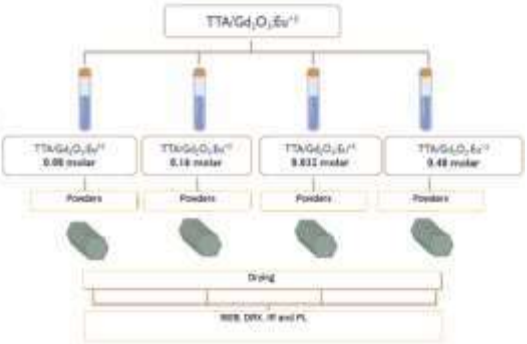
$Gd(NO_3)_3$ was dissolved in ethanol under stirring for 15 min. $Eu(NO_3)_3$ was added and stirring was maintained for 30 min, to add the surfactant F-127 in a Gd: S,1:2 ratio. A sol of Gd_2O_3:Eu^{+3} at 5 mol% was obtained which was subjected to a heat treatment at 800°C.



Synthesis TTA/Gd_2O_3:Eu^{+3}

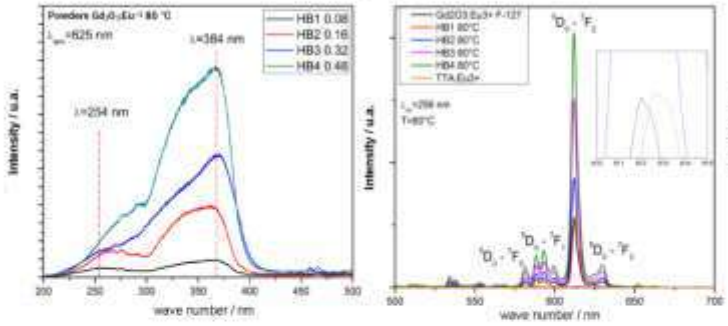
The Gd_2O_3:Eu^{-3} powders were dispersed in 14 ml of ethanol using an ultrasonic bath for 40 min.

On the other hand adequate proportion of TTA was dissoled in ethanol under stirring for 30 min.

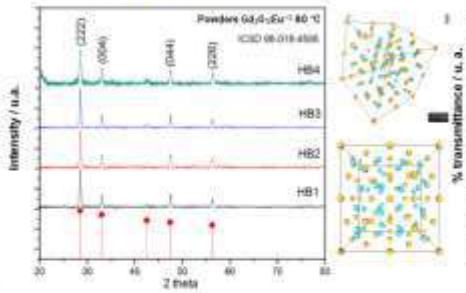


RESULTS AND DISCUSSION

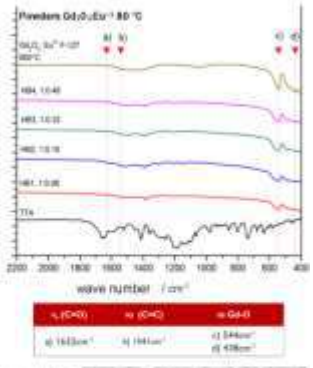
Luminescent properties



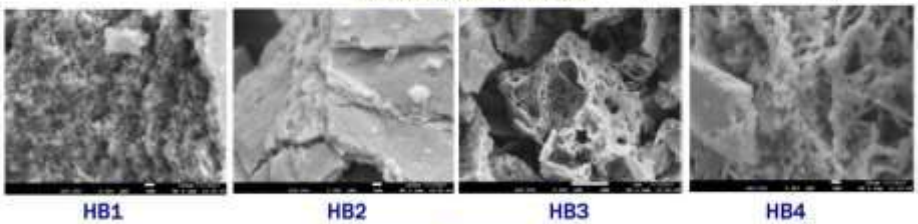
XRD Pattern

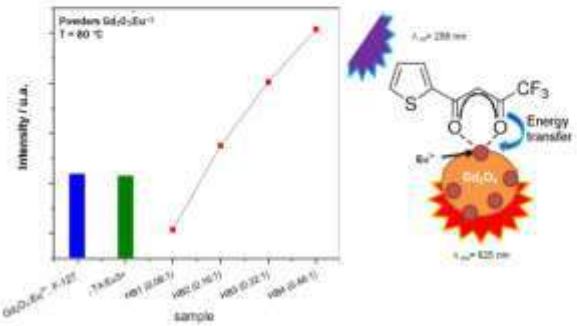


FTIR



Morphological Properties





CONCLUSION

Luminescent powders of TTA/Gd_2O_3:Eu^{+3} with a higher luminescent intensity were synthesized in comparison with the inorganic matrix Gd_2O_3:Eu^{+3} due to the energy transfer of the organic ligand (TTA) and Eu^{+3} bonds. Due to the luminescent properties obtained TTA/Gd_2O_3:Eu^{+3} can have applications in optoelectronic devices.

REFERENCES

S. I. Weissman, "Intramolecular Energy Transfer The Fluorescence of Complexes of Europium," *journal chemical Physics*, no. 10, p. 214, 1942. A. d. J. Morales Ramirez, A. García Murillo, F. d. J. Carrillo Romo, M. García Hernández, D. Jaramillo Vigueras, G. Chaderyron and D. Boyer, "Properties of Gd2O3:Eu3+, Tb3+ nanopowders obtained by sol–gel process," Materials Research Bulletin, vol. 45, pp. 40 - 45, 2010.

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