# "Síntesis y caracterización de polvos luminiscentes TTA/$Gd_2O_3$:$Eu^{3+}$"

Víctor H. Colín Calderón[1], Antonieta García Murillo[1], Dulce Y. Medina[2], Felipe de J Carrillo Romo[1], Andrés Rosas Camacho[1], Victor Manuel Garcia Ramirez[1], Xareni Michell Quiroz Rufino[1].

[1]IPN CIITEC, Cerrada de Cecati s/n, Azcapotzalco, Santa Catarina, 02250 CdMX.

[2] CBI Universidad Autonoma Metropolitana Azc. San Pablo Xalpa 180. México D.F. 02200, México.

# Tabla de Contenido

## 1 Resumen

Se sintetizaron polvos luminiscentes de TTA/$Gd_2O_3$:$Eu^{3+}$ 5% molar en presencia del surfactante Pluronic F-127 a una temperatura de 800°C, dichos polvos se excitaron a una longitud de onda de 254 nm obteniendo una emisión característica del $Eu^{3+}$ con la mayor intensidad luminiscente presente en la transición $^5D_0$ – $^7F_2$. Dichos polvos fueron empleados para obtener el sistema TTA/$Gd_2O_3$:$Eu^{3+}$ por el método sol-gel variando la proporción molar TTA:$Gd_2O_3$ en 0.8:1, 0.16:1, 0.32:1 y 0.48:1 seguido de un tratamiento térmico a 80°C obteniendo como resultado polvos de TTA/$Gd_2O_3$:$Eu^{3+}$ con una mayor intensidad luminiscente con una proporción TTA/$Gd_2O_3$ de 0.48:1 comparada con la matiz inorgánica ($Gd_2O_3$:$Eu^{3+}$ al 5% molar) y la matriz orgánica (TTA:$Eu^{3+}$ al 5% molar). Se presentó una nueva banda de excitación a 384 nm siendo atribuida al mecanismo de transferencia de energía del ligando orgánico al $Gd_2O_3$:$Eu^{3+}$.

Mediante el análisis por espectroscopia infrarroja por transformada de Fourier (FTIR) se caracterizaron los grupos funcionales presentes, a 1541 $cm^{-1}$ aparece la banda correspondiente al enlace C=C que da evidencia del enlace entre el ligando orgánico y el $Eu^{3+}$.

Se confirma una estructura cristalina cúbica característica del $Gd_2O_3$ correspondiente a la carta ICSD 98-018-4595 con un GoF de 3. Se confirma una morfología redondeada de tamaño en escala manométricos. Se continúa con la investigación en la etapa electroluminiscente para su posible aplicación en dispositivos optoelectrónicos.

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### 1.1 < Palabras Clave. >

Luminiscencia, Teoniltrifluroacetona, oxido de gadolinio, europio.



## 2 Abstract

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 resulting powders were dispersed in etanol 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 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).

In the FTIR spectrophotometry, the presence of the bond between Gd-O was observed in approximately The highest peak is associated with the bond intensity associated with the bond (C = C) of the group Carbonyl appears at 1541 $cm^{-1}$ showing the evidence of the affinity whith the organic ligand, the photoluminescence analysis indicated the main transitions of $Eu^{3+}$: $^5D_0$ - $^7F_J$ (J = 0, 1, 2 and 3), obtaining the highest luminescent intensity with a TTA ratio: $Gd_2O_3$ = 0.48 :1.

X-ray diffraction was used to evaluate structural changes as a function of the proportion of TTA added. The results shown a cubic structure wich is characteristic of inorganic matrix without structural changes for all condition and comparated whit the ICSD 98-018-4595 the value GoF is 3.The luminescent powders of the TTA / $Gd_2O_3$: $Eu^{3+}$ systems have possible applications in optoelectronic devices due to their luminescent properties observed.


### 2.1 < Keywords: (3-5 word)>

Luminescence, gadolinium oxide, europium, Thenoyltrifluoroacetone


## 3 Referencias

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S. I. Weissman, "Intramolecular Energy Transfer The Fluorescence of Complexes of Europium," *journal chemical Physics,* no. 10, p. 214, 1942.

B. Yan, "Recent progress in photofunctional lanthanide hybrid materials," *RSC Advances,* no. 2, pp. 9304 - 9324, 2012.

L. Tang, G. Weijum, K. Ding, N. Chen and G. Du, "Ion exchanged YVO4:Eu3+ nanocrystals and their strong luminiscence enhance by energy transfer of thenoyltrifluoroacetone ligans," *Journal of Alloy and compounds,* vol. 590, pp. 277 - 282, 2014.