

ห้องสมุดงานวิจัย สำนักงานคณะกรรมการวิจัยแห่งชาติ



E41058

**SYNTHESIS AND CHARACTERIZATION OF Eu^{3+} DOPED
YTTRIA-STABILIZED ZIRCONIUM OXIDE NANOCRYSTALS
BY CHEMICAL METHOD**

RUNGSIT LUNDA

**A Thesis Submitted to the Graduate School of Naresuan University
in Partial Fulfillment of the Requirements
for the Master of Science Degree in Chemistry
October 2011
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This thesis entitled "Synthesis and Characterization of Eu^{3+} doped Ytria-Stabilized Zirconium Oxide Nanocrystals by Chemical Method" submitted by Rungsit Lunda in partial fulfillment of the requirements for the Master of Science Degree in Chemistry is hereby approved.



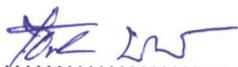
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Rungsit Lunda

Title	SYNTHESIS AND CHARACTERIZATION OF Eu ³⁺ DOPED YTTRIA-STABILIZED ZIRCONIUM OXIDE NANOCRYSTALS BY CHEMICAL METHOD
Advisor	Assistant Professor Lt. Jg. Nipaphat Charoenthai, Ph.D.
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ABSTRACT

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In this research, ZrO₂ crystals co-doped with Y and Eu were prepared by wet chemical method. The mole ratios of Y and Eu were varied while the mole ratio of Zr was kept constant. The ZrO₂: Y: Eu crystals were obtained by calcination at 800 °C for 1 h. From XRD, FT-IR spectra, it was found that the monoclinic phase of pure ZrO₂ crystals transformed to tetragonal and cubic phase upon introducing Y and Eu into the crystals. The effect of phase transformation on optical property of ZrO₂ doped with Y and Eu was investigated by photoluminescence (PL) under UV excitation at 260 nm. The PL spectra of samples exhibited a red luminescent emission of Eu. The ZrO₂: 4%Y: 3%Eu crystals provided the highest luminescence efficiency with the cubic structure. The PL intensity varied with the calcinations temperature, ranging from 600 to 1000 °C. The calcination temperature at 800 °C yielded highest PL intensity. The variation of chelating agents used during the preparation process does not affect the crystal structure of ZrO₂: 3%Eu: 4%Y. The emission intensity, however, varied with type of chelating agents. These phosphor materials were embedded in various polymeric films. PL spectra of composite films of ZrO₂: 4%Y: 3%Eu embedded in different polymers exhibited strong red regions. The emission intensity of composite films depended on the polarity of the polymer.

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ABBREVIATIONS

CRT	=	cathode ray tube
LEDs	=	light emitting diodes
PDP	=	plasma display panel
EL	=	electroluminescence
ACTFEL	=	alternating current thin film electroluminescent
FED	=	field Emission Display
UV/VIS	=	ultraviolet and Visible
RE ³⁺	=	rare earth ions
Eu ³⁺	=	europium ion
Tb ³⁺	=	terbium ion
Dy ³⁺	=	dysprosium ion
Er ³⁺	=	erbium ion
Pr ³⁺	=	presidium ion
Sm ³⁺	=	samarium ion
TM	=	transition metal
Mn	=	manganese
Ni	=	nikel
eV	=	electron volts
A.R.	=	analytical reagent
M	=	molar
pH	=	power of hydrogen ion concentration
EDTA	=	ethylenediaminetetraacetic acid
PVA	=	polyvinylalcohol
PS	=	polystyrene
PMMA	=	polymethylmethacrylate
PAA	=	polyacrylic acid
DI	=	deionized
mg	=	milligram

ABBREVIATIONS

CRT	=	cathode ray tube
LEDs	=	light emitting diodes
PDP	=	plasma display panel
EL	=	electroluminescence
ACTFEL	=	alternating current thin film electroluminescent
FED	=	field Emission Display
UV/VIS	=	ultraviolet and Visible
RE ³⁺	=	rare earth ions
Eu ³⁺	=	europium ion
Tb ³⁺	=	terbium ion
Dy ³⁺	=	dysprosium ion
Er ³⁺	=	erbium ion
Pr ³⁺	=	presidium ion
Sm ³⁺	=	samarium ion
TM	=	transition metal
Mn	=	manganese
Ni	=	nikel
eV	=	electron volts
A.R.	=	analytical reagent
M	=	molar
pH	=	power of hydrogen ion concentration
EDTA	=	ethylenediaminetetraacetic acid
PVA	=	polyvinylalcohol
PS	=	polystyrene
PMMA	=	polymethylmethacrylate
PAA	=	polyacrylic acid
DI	=	deionized
mg	=	milligram

ABBREVIATIONS (CONT.)

XRD	=	x-ray diffraction
FT-IR	=	fourier transform infrared spectroscopy
SEM	=	scanning electron microscopy
PL	=	photoluminescence
JCPDS	=	joint committee on powder diffraction standards
(h k l)	=	miller indices
λ	=	wavelength (lamda)
kW	=	kilowatts