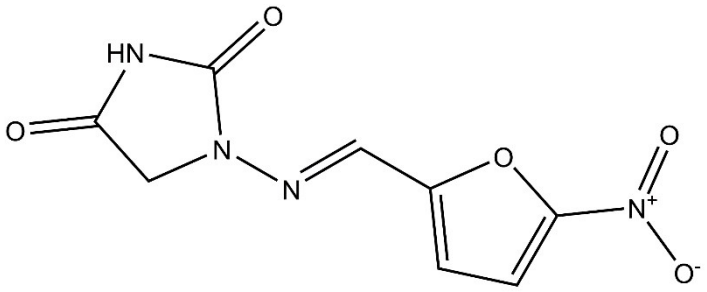
Electronic Supplementary Material (ESI) for RSC Advances.



1-[[(5-nitro-2-furanyl) methylene] amino]-2-4, imidazolidinedione]

Fig. S1: The chemical structure of nitrofurantoin.

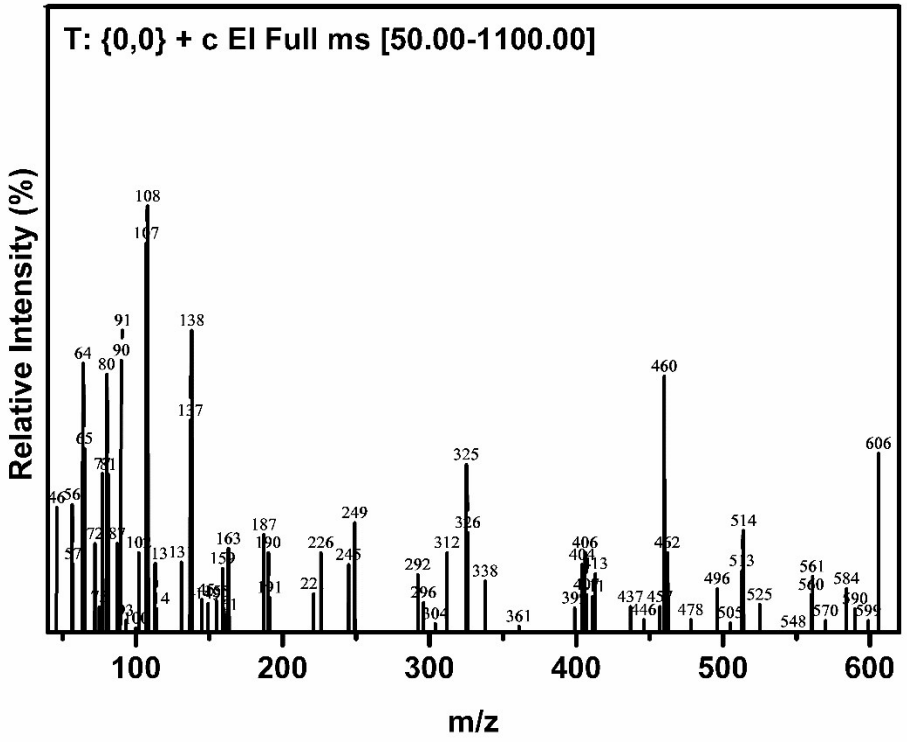


Fig. S2: The mass spectrum of the nano-lanthanum complex.

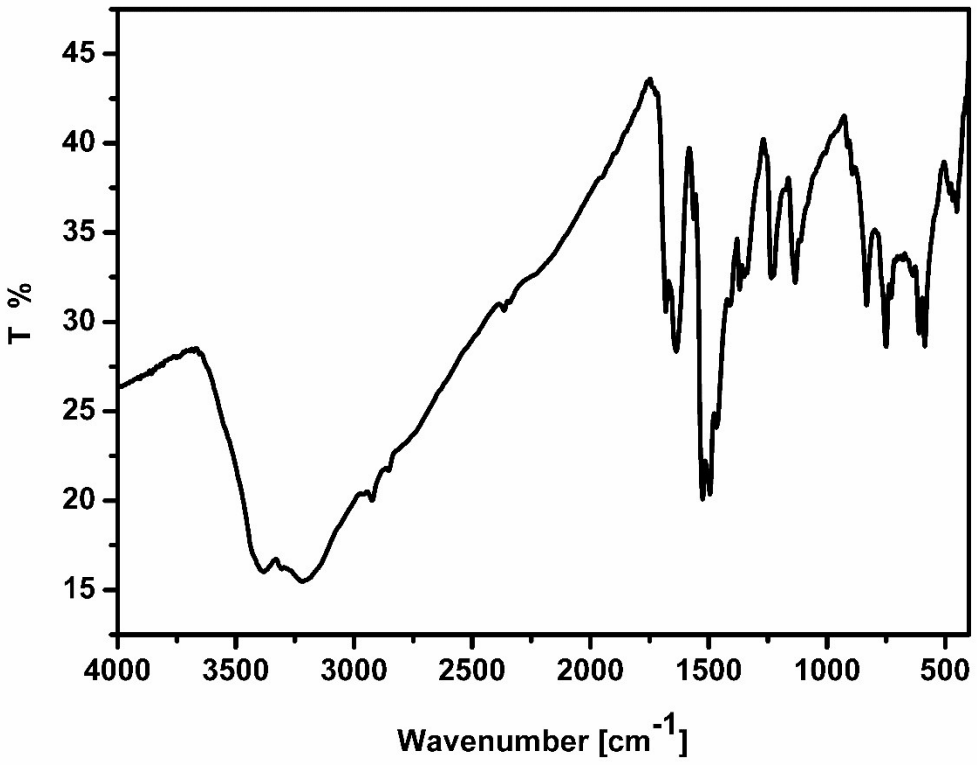


Fig. S3: The FT-IR spectrum of nano-lanthanum complex.

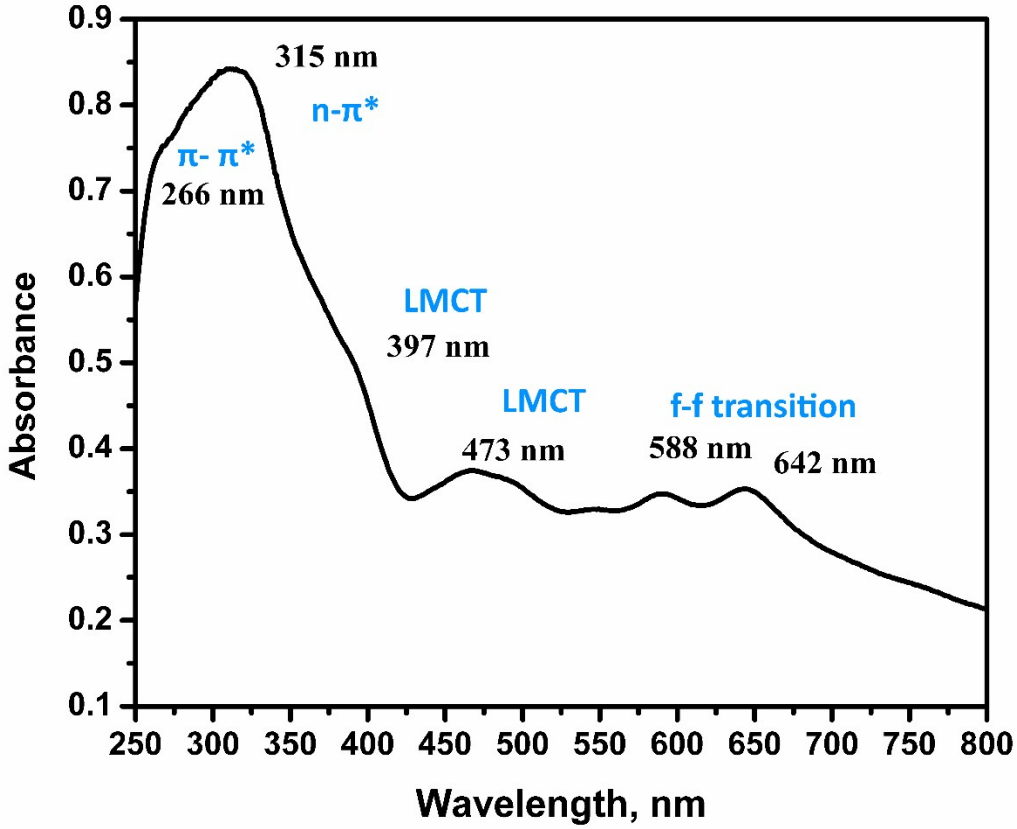


Fig. S4: The electronic absorption spectrum of nano-lanthanum complex.

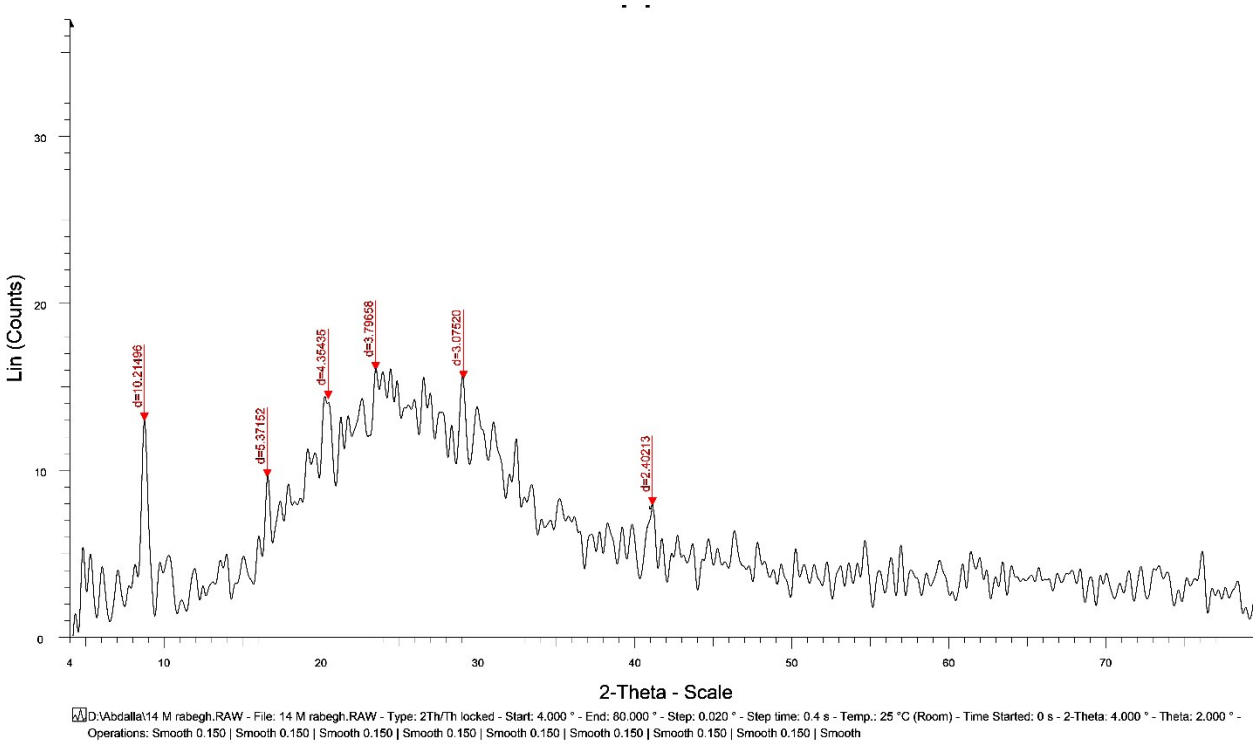


Fig. S5: The X-ray diffraction spectrum of the nano-lanthanum complex.

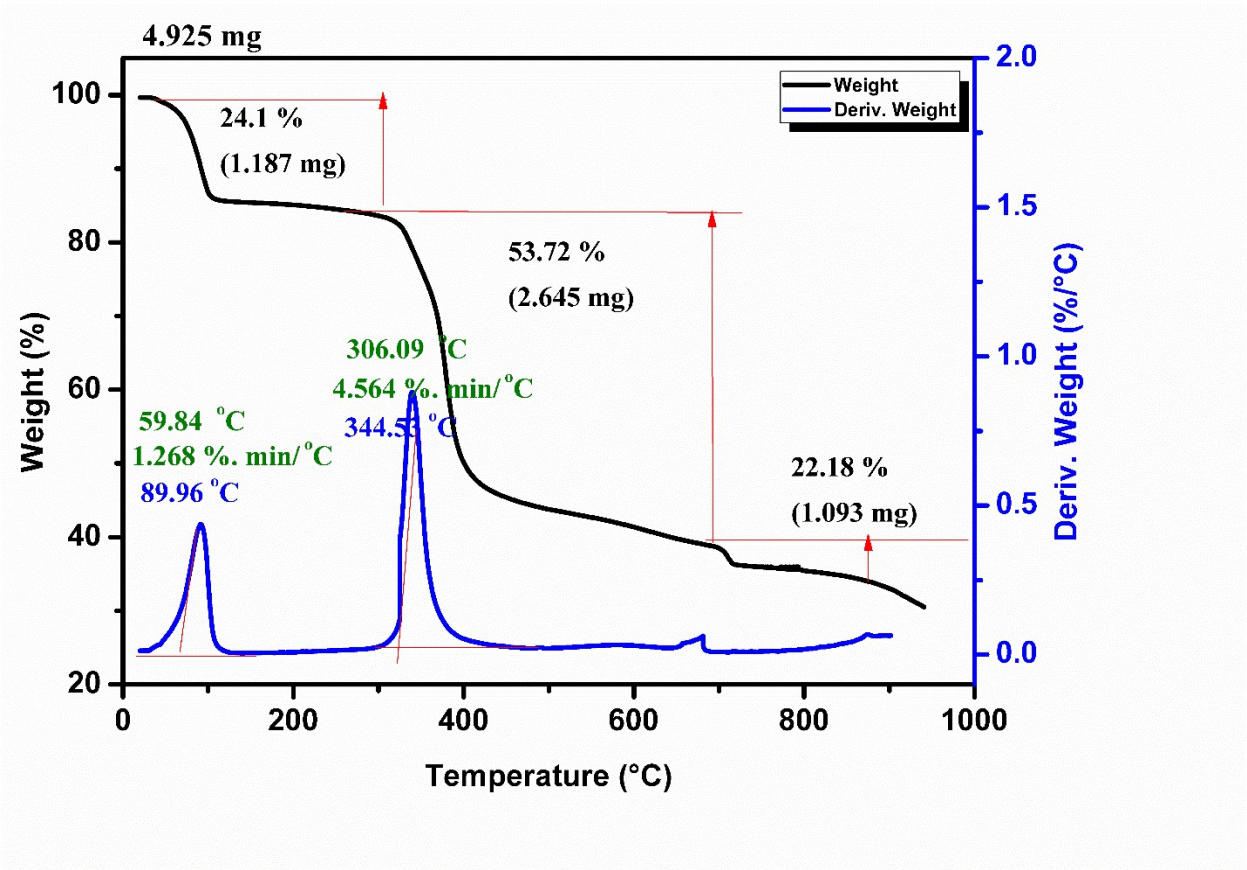


Fig. S6: The thermogravimetric analysis (TGA-DTGA) of the of the nano-lanthanum complex.

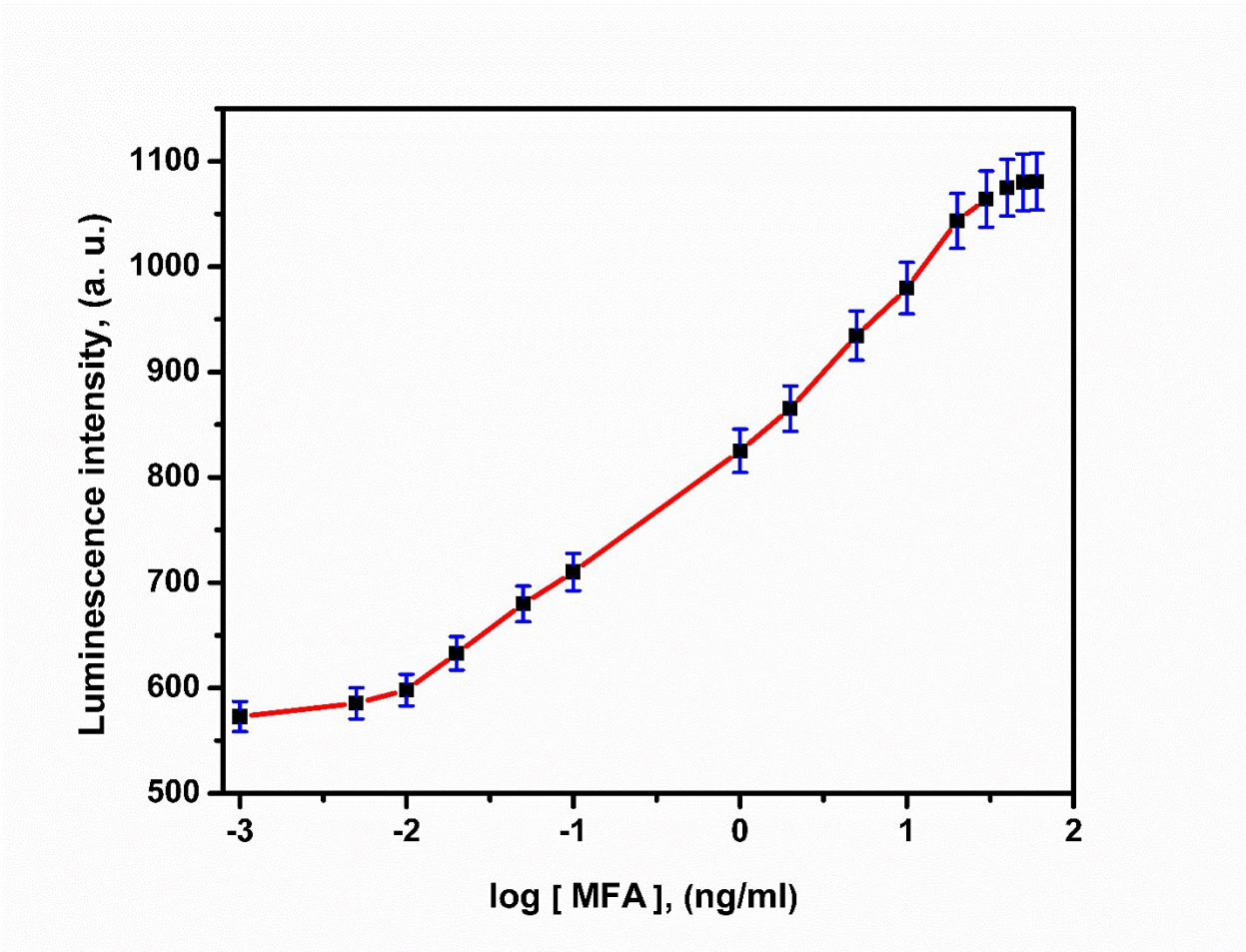
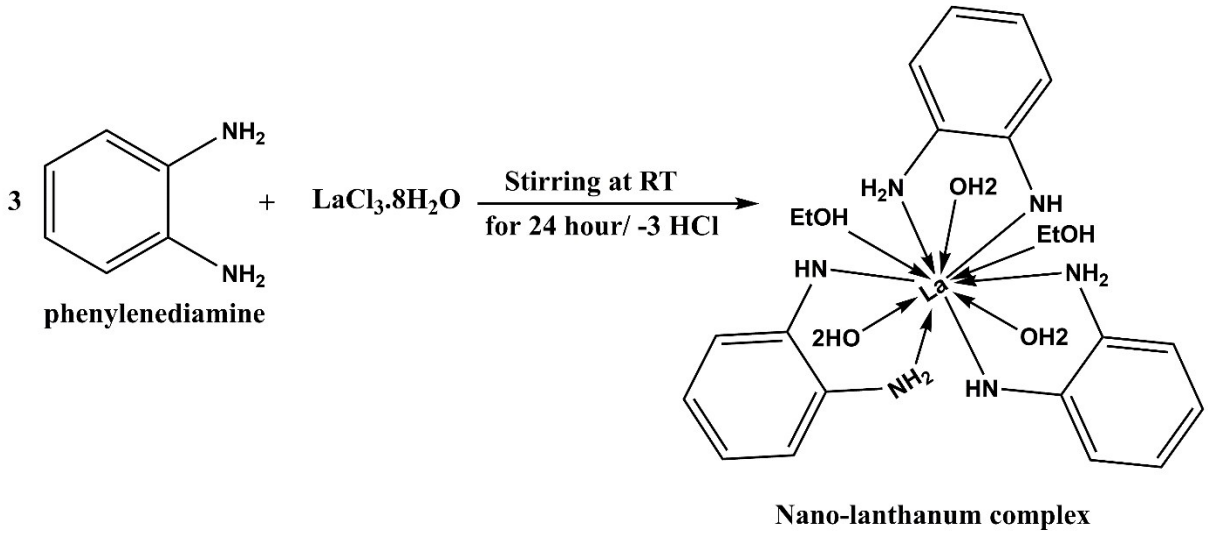
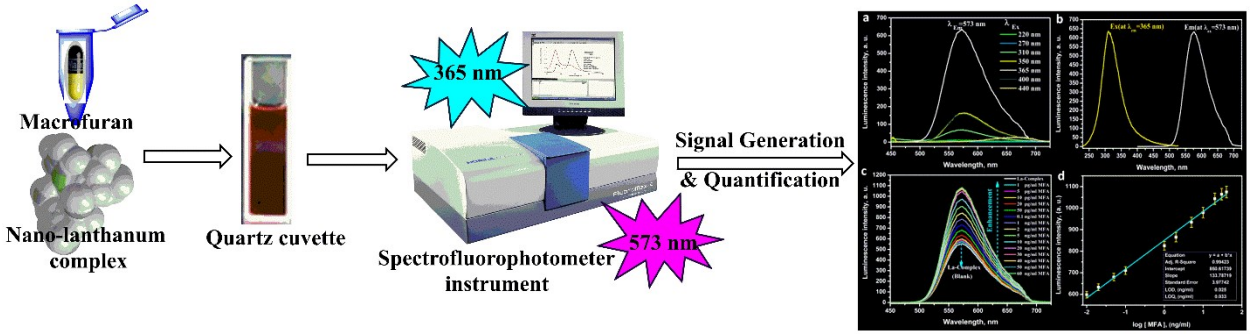


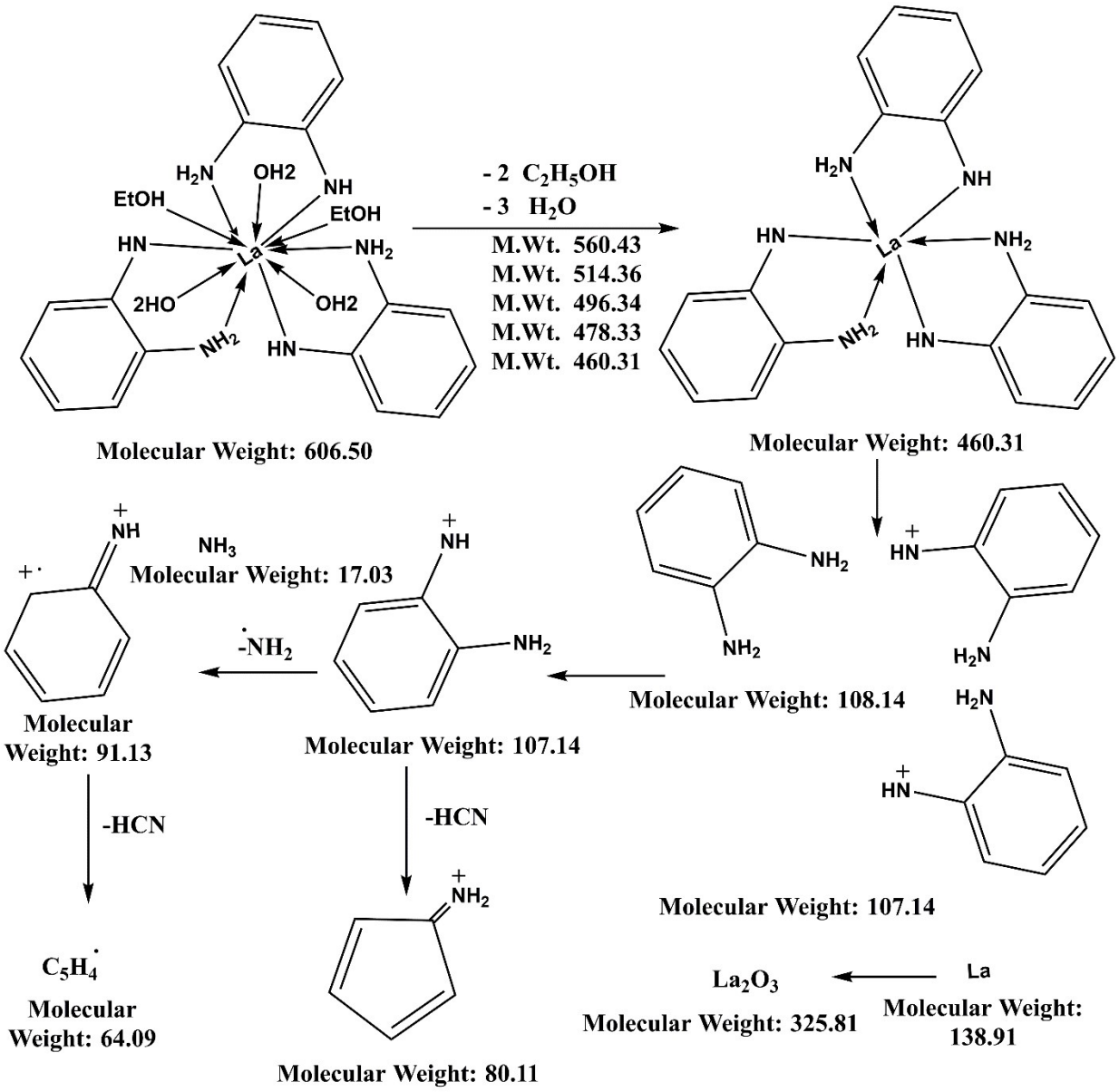
Fig. S7. A full relationship (calibration graph) between the PL intensity of nano-lanthanum complex and the logarithm MFA concentration (log [MFA]).



Scheme S1: The proposed mechanism of the nano-lanthanum complex synthesis.



Scheme S2: The Schematic diagram of the spectrofluorimetric chemosensor measurements based on the nano-lanthanum complex.



Scheme S3: The proposed fragmentation Scheme of the nano-lanthanum complex.

Table S1: EDX analysis of the Nano-lanthanum complex.

Element	Theoretically calculated	EDX analysis			
		Weight %	Atomic %	Net Int.	Error %
C	43.57	43.85	48.10	125.57	7.27
N	13.86	13.15	13.03	15.09	15
O	13.19	13.09	35.86	8.09	16.82
La	22.90	22.91	2.19	1.59	64.48

Table S2: Summary of XRD data, Miller indices and interplanar distances of nano-lanthanum complex.

Peak No.	2θ	Intensity	Intensity	d value	Θ Radians	Sin θ	Sin 2θ	Ratio 1	Ratio 2	(hkl)
	Å	count	%	Å	Å	Å	Å			
1	8.649	13	81.3	10.215	0.075477	0.07541	0.00568	1	2	
2	16.49	9.55	59.7	5.3714	0.143902	0.14341	0.02056	3.6169	7.2337	
3	20.379	14.3	89.4	4.3543	0.17784	0.1769	0.03129	1.5217	3.0434	
4	23.412	16	100	3.7966	0.204308	0.20289	0.04116	1.3154	2.6307	101
5	28.013	15.5	96.9	3.0751	0.253186	0.25049	0.06274	1.5243	3.0485	222
6	32.407	9.56	59.8	2.4021	0.326438	0.32067	0.10283	1.6388	3.2776	300

Table S3: Summary of calculated crystallite size of nano-lanthanum complex at different position on XRD patterns

Position	Area	Cry Size L(nm)	Microstrain	RMS Strain(%)
10.67216	32.82508	85.3	0.1	0.1
13.92048	7.835903	70.9	0.1	0.1
15.44008	8.44597	93.1	0.1	0.1
16.44166	4.282996	85.6	0.1	0.1
17.15561	10.32127	113.2	0.1	0.1
18.0078	8.527215	79.1	0.1	0.1
19.43682	17.28139	71.5	0.1	0.1
21.4653	10.38678	88	0.1	0.1
22.90463	26.61321	84.4	0.1	0.1
23.90302	2.283607	100.7	0.1	0.1
24.63041	3.814078	74.2	0.1	0.1
27.99914	14.93932	88.1	0.1	0.1

Table S4. Sensitivity and regression parameters for nano-lanthanum complex chemosensor

Parameter	Method
λ_{em}, nm	573
Linear range, ng/ml	0.02 – 30.0
Limit of detection (LOD), ng/ml	0.025
Limit of quantification (LOQ), ng/ml	0.033
Regression equation	(Y=a+bX)*
Intercept (a)	850.617
Slope (b)	133.787
Standard deviation	3.977
Correlation coefficient (r^2)	0.994

**Y, is photoluminescence intensities; X, is concentration of MFA in ng/ml; a, is intercept; b, is slope*

Table S5: Evaluation of intra-day, inter-day accuracy, and precision study.

MFA Added, ng/ml	Repeatability Intra-day precision				Reproducibility Inter-day precision			
	X	SD	CV	RE%	X	SD	CV	RE%
0.05	0.05	1.77	0.003	1.0	0.053	3.14	4.07	0.943
2.0	1.955	2.16	3.124	1.002	1.991	1.54	1.16	1.004
10.0	9.972	1.98	2.015	1.003	10.12	2.45	2.09	0.988

* Each reading was repeated three times; X, mean values; SD, standard deviation; CV, the coefficient of variation; %RE, percent of relative error.

2.1. Materials

1, 2-phenylenediamine $C_6H_8N_2$; melting point 100-102 °C; 99.5%, $LaCl_3.8H_2O$; 99.99%, and nitrofurantoin; 99.9% were purchased from Sigma-Aldrich. The other biological molecules as well other drugs and pharmaceutical formulations were purchased from a local company. All solvents and chemicals used in this study were of analytical reagent grade and were used as received.

The real biological samples (blood serum, plasma and urine samples) used in this study collected from a medical lab. The samples were handled, treated in accordance to standard precautions guidelines to avoid the potentially infectious.

The pharmaceutical formulation containing nitrofurantoin is Macrofuran 100 mg capsules which obtained from local drug stores, this drug is supplied by Egyptian Int. Pharmaceutical Industries.

2.2. Instruments

The characterization and applications were performed using different analytical techniques: The FE-SEM images and EDX spectroscopy spectra were recorded with a combination of field emission scanning electron microscopy (FE-SEM), and element mapping by spatially resolved energy-dispersive X-ray spectroscopy (EDX) (JEOL JSM-6510LV, Japan). The mass spectra of nano-lanthanum complex were recorded using a Thermo Scientific- ISQ single quadrupole mass spectrometer (Thermo Scientific, USA). The Fourier-transform infrared (FT-IR) spectra were recorded with a JASCO FT/IR-460 spectrophotometer with the use of KBr tablets in the range from 400 to 4000 cm^{-1} at room temperature (JASCO, USA). Elemental analysis (C-H-N) was performed using a Costech ECS-4010- analyzer (Costech, Italy). The UV-vis spectra were obtained using V-770 UV-Visible/NIR spectrophotometer (JASCO, USA). The X-ray diffraction (XRD) analysis of nano-lanthanum complex was performed with a D8-AVANCE X-ray diffractometer (Bruker, Germany) with Cu-Kα radiation (λ =0.154056 nm) for identification of the crystalline phase, relative crystallinity, and crystal size of as-prepared nano-lanthanum complex. The XRD analysis was performed in the 2θ range from 3.105° to 70.086° with a 0.020° step at a scan speed of 0.4 s. The crystallite size was calculated from XRD data by means of the Scherrer equation. Thermogravimetric Analysis (TGA/DTGA) of the samples was carried out with a Universal V4.5-TA Instruments (USA), with a rate of 10 °C min^{-1}.

The photoluminescence (PL) spectra were investigated using a (Shimadzu RF-5301PC spectrofluorophotometer). The samples were used for subsequent PL measurements at different excitation wavelengths and then at an excitation wavelength 365 nm and an emission wavelength of 573 nm. The measurements were performed in a quartz cuvette of path length 1 cm, with a scan time of 30 s, at room temperature. The data were analyzed with Origin-8. The structures, 3D geometrical structures and Schemes were drawn using "ChemBioDraw Ultra12" program.