



**National Conference on  
SCIENCE, TECHNOLOGY AND APPLICATIONS OF RARE EARTHS  
(STAR-2022)**

**September 22-23, 2022**

# **SOUVENIR**

Jointly Organized by

**Rare Earths Association of India &  
Department of Physics and Chemistry  
Sri Venkateswara University,  
Tirupati - 517502**





**Prof. K. Raja Reddy**

Vice-Chancellor,  
S.V. University, Tirupati.

I am delighted to know that the Department of Physics & Chemistry and Rare Earths Association of India, Mumbai are jointly organising the National Conference on Science Technology and Applications of rare Earths on the Theme “**Role of Rare Earths in make in India and Atmanirbhar Bharath**” on 22<sup>nd</sup> & 23<sup>rd</sup> September 2022.

The theme of the conference is more relevant in the present scenario and is a step towards achieving our vision in becoming a world-class academic and research institution in order to produce good Scientists/Researchers. Research about Rare Earth provides excellent opportunities in the field of lasers and modern fiber optic communications.

I am glad to note that several eminent academicians and scientists from all over India are participating in this Conference. I am quite sure that the conference will provide a common platform for deliberations and discussions which would lead to mutual progress and development in Academic and Research activities. I wish this conference will be a foundation for the growth of new ideas towards a better tomorrow.

I wish the organizers of this conference all successes.

A handwritten signature in black ink, appearing to read 'K. Raja Reddy', written in a cursive style.

(Prof. K. Raja Reddy)  
Vice-Chancellor

*Message*

## STAR-2022 PROGRAMME

**Venu:** Senate Hall, Neelam Sanjeeva Reddy Bhavan (Adm. Building), S.V. University, Tirupati

### 22-09-2022 (Day 1, Thursday)

8.30 AM to 5.00 PM	Registration (Please avoid during sessions)	
9.30 AM to 11.15 AM	Inauguration/Keynote address	
11.15 AM to 11.45 AM	Tea Break	
11.45 AM to 12.30 PM	Plenary-1	Dr. M.L.P. Reddy
12.30 PM to 1.00 PM	IT-1	Dr. D.K. Singh
1.00 PM to 2.00 PM	Lunch (Dept. of Physics)	
1.00 PM to 3.00 PM	Poster-1 (Dept. of Physics/Chemistry) PP-001 to PP-040. Please stick your poster on respective boards latest by 12.00 Noon.	
3.00 PM to 3.45 PM	Plenary-2	Dr.R. Gopalan
3.45 PM to 4.00 PM	Tea	
4.00 PM to 4.30 PM	IT-2	Dr.P. Prabhakara Rao
4.30 PM to 5.00 PM	IT-3	Dr. S. K. Sahu
5.00 PM to 6.00 PM	Oral 1 to 5	

### 23-09-2022 (Day 2, Friday)

9.00 AM to 2.00 PM	Registration (Please avoid during sessions)	
9.30 AM to 10.15 AM	Plenary-3	Dr. S. Natarajan
10.15 AM to 10.45 AM	IT-4	Dr. S. J. Dhoble
10.45 AM to 11.15 AM	IT-6	Dr. Vibha Chopra
11.15 AM to 11.30 AM	Tea	
11.30 AM to 11.45 AM	IYoG-2022 Contribution by Dept. of Physics, SVU on glass and rare earth research	By Participants, Researchers, etc. (Chairperson Dr. C.K. Jayasankar)
11.45 AM to 12.15 PM	IT-5	Prof. A.S. Rao
12.15 PM to 12.45 PM	IT-7	Dr. R. Arun Kumar
12.45 PM to 1.15 PM	IT-8	Dr. P.K. Padhi
1.15 PM to 2.00 PM	Lunch	
1.00 PM to 3.15 PM	Poster-II (Dept. of Physics/Chemistry) PP-041 to PP-086. Please stick your poster on respective boards latest by 12.00 Noon.	
3.15 PM to 3.30 PM	Tea	
3.30 PM to 4.00 PM	IT-9	Prof. Y.C. Ratnakaram
4.00 PM to 4.30 PM	IT-10	Dr. K. Marimuthu
4.30 PM to 5.20 PM	Oral 6 to 10	
5.20 PM to 5.45 PM	Valedictory/prize distribution	

## Index for Abstracts

### PLENARY TALKS

S. No	Code	Title of the Paper	Authors
1.	Plenary Talk-01	Organelle-Specific luminescent lanthanide complexes: From Molecular Design To Bioimaging	Dr. M. L. P. Reddy (22-09-2022)
2.	PT-02	Opportunities and Challenges in Rare Earth Magnets for Electric Vehicle Applications	Dr. R. Gopalan (22-09-2022)
3.	PT-03	From Mineral Structure to White Light Emission	Prof. Srinivasan Natarajan (23-09-2022)

### INVITED TALKS

#### Day 1 (22 September 2022, Thursday)

4.	IT-01	Rare earth based Inorganic Pigments – Secure and Sustainable for Multifunctional Applications	Dr. P. Prabhakara Rao and Dr. M. L. P. Reddy
5.	IT-02	Separation of Rare Earths: Challenges and Innovations	Dr. D. K. Singh
6.	IT-03	Spent NdFeB Magnet: A Valuable Secondary Resource of Rare Earths	Dr. Sushanta K. Sahu

#### Day 2 (23 September 2022, Friday)

7.	IT-04	Phosphors for plant cultivation LED lighting	Prof. S. J. Dhoble
8.	IT-05	Photoluminescence studies of Rare Earth doped glasses for White LED and other photonic Applications	Prof. A. S. Rao
9.	IT-06	Development of Thermoluminescent Phosphors for Dosimetric Applications	Dr. Vibha Chopra
10.	IT-07	Rare earth doped borate single crystals for Dosimetry applications	Dr. N. Ravikumar, Dr. Mitrabhanu Behera and Dr. R. Arun Kumar
11.	IT-08	Multifaceted Rationalization of Rare Earth doped Materials For Up-& Down conversion of Photon Energy: Progress and Recent Advances	Dr. R. K. Padhi, Dr. P. Ramakrishna, Dr. K. Sundararajan
12.	IT-09	An overview of research work done in rare earth doped glass science during the last two decades in the department of Physics from my group	Prof. Y. C. Ratnakaram
13.	IT-10	Review on the role of Indian Scientists on rare earth doped glass research for photonic applications.	Dr. K. Marimuthu

54	PP-054	Neodymium doped oxyfluoride glasses for solid-state device applications	Basavaraj Gurav and Devidas G.B
55	PP-055	Er <sup>3+</sup> doped TeO <sub>2</sub> -WO <sub>3</sub> -GeO <sub>2</sub> glasses for visible lasers	G. Pullaiah, K. Venkata Rao and B.C. Jamalaih
56	PP-056	Sensitization effect of Nd <sup>3+</sup> ions on Yb <sup>3+</sup> /Nd <sup>3+</sup> co-doped oxyfluoride glasses and their optical, fluorescence, and upconversion studies for visible laser and NIR amplifier applications.	B. Kiran Kumar, Megala Rajesh, P. Reddi Bubu and B. Deva Prasad Raju.
57	PP-057	Optical and spectroscopic investigations on Er <sup>3+</sup> doped bismuth based phosphate glasses for optical amplifier applications	P. Reddi Babu, P. Pavithra and B. Deva Prasad Raju
58	PP-058	Study of optical properties and Up-conversion mechanism in Nd <sup>3+</sup> /Yb <sup>3+</sup> ions co-doped SiO <sub>2</sub> -Al <sub>2</sub> O <sub>3</sub> -Na <sub>2</sub> CO <sub>3</sub> -SrF <sub>2</sub> -CaF <sub>2</sub> oxyfluoride glasses for photonic applications	G.Uma Maheswar, V. Ramaswamy and B. Deva Prasad Raju
59	PP-059	Structural, optical and spectroscopic investigations on Nd <sup>3+</sup> doped bismuth based phosphate glasses for laser optic applications	P. Pavithra , P. Reddi Babu and B. Deva Prasad Raju
60	PP-060	Spectral studies of Nd <sup>3+</sup> doped different fluorophosphate glasses for their aptness in laser applications at 1060 nm	B. Surya Narayana Devara, M.Kumar and Y.C. Ratnakaram
61	PP-061	Structural and optical studies of Yb <sup>3+</sup> /Nd <sup>3+</sup> co-doped phosphate based barium magnesium fluorotellurite glasses	S. Devendra and L. Siva Sankar Reddy.
62	PP-062	Investigation of Sm <sup>3+</sup> doped P <sub>2</sub> O <sub>5</sub> -CdO-Bi <sub>2</sub> O <sub>3</sub> -ZnO phosphate glasses for reddish orange light applications	D. Ganesh, Ch. Anjaneyulu and G.G. Dhar
63	PP-063	A novel Eu <sup>3+</sup> doped Na <sub>4</sub> Mg(PO <sub>4</sub> ) <sub>2</sub> red-emitting phosphor for solid state lighting	N.Chandana, G.Pushpa Chakrapani and G.G. Dhar
64	PP-064	Photoluminescence Studies on Pr <sup>3+</sup> and Dy <sup>3+</sup> doped P <sub>2</sub> O <sub>5</sub> -CdO-MgO-PbF <sub>2</sub> glasses	P.Vijayalakshmi, Y. Ramakrishna , G.Chandana , K. Srinivasulu, M. Bhaskar Naik and G.G. Dhar
65	PP-065	Investigation of structural and luminescence behaviour of Dy <sup>3+</sup> doped sodium barium borate phosphor for luminescent device applications	Tanisha Bhadauria, Divyanshi Nagpal and M. Jayasimhadri

# Sensitization effect of $\text{Nd}^{3+}$ ions on $\text{Yb}^{3+}/\text{Nd}^{3+}$ co-doped oxyfluoride glasses and their optical, fluorescence, and upconversion studies for visible laser and NIR amplifier applications.

B. Kiran Kumar<sup>1,2</sup>, Megala Rajesh<sup>1</sup>, P. Reddi Bubu<sup>1</sup> and B. Deva Prasad Raju<sup>1</sup>.

<sup>1</sup>Department of Physics, Sri Venkateswara University, Tirupati – 517 502, India.

<sup>2</sup>Department of Physics, Government Degree College, Rayachoty-516 269, India.

**Abstract:** The development of laser technology has put an intense demand on optical confinement materials with high performance are needed. Herein the authors have been investigated the  $\text{Yb}^{3+}$ - singly doped and  $\text{Yb}^{3+}/\text{Nd}^{3+}$ -codoped  $\text{SiO}_2$ -based oxyfluoride glasses optical absorption, near- infrared (NIR), and up-conversion (UC) emissions including emission decay profiles in this work. Under 808 nm laser diode (LD) excitation, four NIR emission bands were observed *i.e.*, ( $\text{Nd}^{3+}$ :  $4\text{F}_{3/2} \rightarrow 4\text{I}_{9/2}$ ,  $\text{Yb}^{3+}$ :  $2\text{F}_{5/2} \rightarrow 2\text{F}_{7/2}$ ,  $\text{Nd}^{3+}$ :  $4\text{F}_{3/2} \rightarrow 4\text{I}_{11/2}$ , and  $\text{Nd}^{3+}$ :  $4\text{F}_{3/2} \rightarrow 4\text{I}_{13/2}$ ) in co-doped glasses. NIR emission cross-sections [ $\sigma_{emi}$  stimulated, ( $\sigma^M$ ) from Mc-cumber theory] were calculated for  $2\text{F}_{5/2} \rightarrow 2\text{F}_{7/2}$  (~1030 nm) transition of  $\text{Yb}^{3+}$  ion.  $\sigma_{emi}$  were found to be highest ( $26.27 \times 10^{-21} \text{ cm}^2$ ) for  $\text{Yb}^{3+}$ :  $2\text{F}_{5/2} \rightarrow 2\text{F}_{7/2}$  transition in N2 glass. UC emission spectra recorded by 980 nm LD shows bands centered at 500, 536, 595 & 610, and 664 nm, attributed to  $4\text{G}_{9/2} \rightarrow 4\text{I}_{9/2}$ ,  $4\text{G}_{7/2} \rightarrow 4\text{I}_{9/2}$  &  $4\text{G}_{7/2} \rightarrow 4\text{I}_{11/2}$ ,  $4\text{G}_{5/2} \rightarrow 4\text{I}_{9/2}$ , and  $4\text{G}_{9/2} \rightarrow 4\text{I}_{13/2}$  transitions respectively. Decay profiles were analyzed for  $\text{Yb}^{3+}$ :  $2\text{F}_{5/2} \rightarrow 2\text{F}_{7/2}$  (~1030 nm) and  $\text{Nd}^{3+}$ :  $4\text{F}_{3/2} \rightarrow 4\text{I}_{11/2}$  (~1057 nm) transitions upon 808 nm LD. Energy transfer (ET) process from  $\text{Nd}^{3+}$  to  $\text{Yb}^{3+}$  have been observed in the present glasses system

**Keywords:** Oxyfluoride glasses;  $\text{Nd}^{3+}$  and  $\text{Yb}^{3+}$  ions; NIR fluorescence; Energy transfer; Gain cross-section; Upconversion.

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## Best Paper Award


Is hereby awarded to B. Kiran Kumar,

Dept. of Physics, S.V. University, Tirupati.

for the Oral/Poster Paper presentation entitled: Sensitization effect of Nd<sup>3+</sup> ions.

in STAR - 2022.



  
Chairman

  
Convener - I

  
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# Certificate

This is to certify that Banganji Kiran Kumar  
Lecturer in Physics, Govt. Degree College, Rayachoti.  
has participated and presented the Paper entitled: Densitization effect of  
 $Nd^{3+}$  ions on  $Yb^{3+}/Nd^{3+}$  co-doped oxyfluoride glasses  
and their optical, fluorescence, and ----- in STAR - 2022.

  
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