FUTURE APPLICATIONS AND CHALLENGES OF REMOTE SENSING, GPS AND GIS IN DISASTER MANAGEMENT IN INDIA

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Abstract: Geographic Information Systems (GIS), Remote Sensing(RS) and Global Positioning Systems (GPS) have gained much attention for their applications in disaster management and are increasingly utilized throughout the entire disaster management cycle as a tool to support decision making. GIS is commonly recognized as a key support tool for disaster management. The real expansion of the application of GIS to disasters began with the advent of ubiquitous computer use, especially affordable desktop computers and software in the 1980s and 1990s. Along with software and hardware availability, increasing number of hazard datasets, both for the United States and internationally, have become accessible and the application of GIS technology has rapidly expanded in both disaster research and practice.

Keywords: Applications, Future Threats, Impacts, Possible Implications.

Introduction: India is fast moving into being an information and knowledge society- especially with the emphasis on information technology and 'transparent-governance'. Amongst the variety of data sets that would be involved, spatial information will be a major "content". These special information sets are vital to make sound decisions at the local, regional, state and central level planning, implementation of action plans, infrastructure development, disaster management support and business development. Natural resources management, flood mitigation, environmental Restoration, land use assessments and disaster recovery are just a few examples of areas in which decision makers are benefiting from spatial information. Until recently, maps have been a mainstay for a wide variety of applications and decision making. The establishment of the spatial data infrastructure defined as the technologies, policies, and people necessary to promote sharing of geo spatial data throughout all levels of government, the private and non-profit sectors, and the academic community. The goal of this infrastructure is to reduce the duplication of effort among agencies, improve quality and reduce costs related to geographic information, to make geographic data more accessible to the public, to increase the benefits of using available data and to establish key partnerships with States, countries, cities, tribal Nations, Academia and the private sector to increase data availability. In the emerging information, geographic or geo spatial information occupies a pre-eminent position. In fact, the use of high quality, reliable, geo special information is critical to virtually every sphere of socio economic activity disaster management, forestry, urban planning, land management, agriculture, infrastructure development, business, Geographic, etc. There is a widespread consensus that spatial data sets need to be integrated to create what is called a Geo-spatial data infrastructure. Such Infrastructures have been likened to information highways, linking a variety of databases and providing for the flow of information from local to national levels and eventually to the Global community. The foundation of any Geo-spatial data infrastructure is the topographic map. The custodian of all topographic data in India has been the survey of India, which established 233 years ago is probably the oldest scientific institution in the country. The creation of such and infrastructure will be a landmark development of enormous significance for a knowledge-enabled society. In India, Government continues to play a major role in inventory and mapping of major national resources and establishing a map information base in the country. A major challenge over the next decade will be to increase the use of specially referenced data to support a wide variety of decisions at all levels of society.

Over the past few years, Government and private agencies have invested considerably in establishing GIS databases. In a way, India has had a strong foundation of a spatial data infrastructure - through mainly analog and paper map based traditionally, the central spatial based traditionally the central spatial traditionally the central spatial information infrastructure has been managed as a set of discrete mapping responsibilities within several central agencies.

It is often stated that the major problem in disaster management is not lack of technology or the existence of relevant information, but lack of 'information' about the information. This is especially true for geo-information. Typically,disaster management depends on large volumes of accurate, relevant, on-time geo- information that various organizations systematically create and maintain. Access to information gathering and organizing technologies like Remote Sensing, GIS and GPS that have proven their usefulness in Disaster Management. With the availability of satellite-based remote sensing data and the organisation of spatial data bases around a GIS, combined with the GPS, the process of semantic spatial Information Systems has now become a reality. The advent of GIS technology has transformed spatial data handling capabilities and made it necessary for re-examining the roles of government with respect to the supply and availability of geographic information. Although Natural disaster cannot be prevented fully, but their impact can be reduced with disaster management strategies aided by latest technological development. One such technology is the Geo-informatics consisting of Remote Sensing, Geographical Information system (GIS), Global Positioning System (GPS) and Information Technology (IT) offers a powerful tool for disaster assessment, monitoring managing and risk zonation etc. When a disaster occurs the Geo-information's media are the quickest mode of information collection and can be utilized for monitoring during the event. Remote sensing and GIS offers a powerful tool to create maps, integrate information, visualize scenarios, solve complicated problems and develop effective solutions in Disaster Management.

Further, with the availability of Precision, high-resolution satellite images, data enabling the organization of GIS, combined with the Global Positioning System (GPS), the accuracy and information content of these spatial datasets or maps is extremely high.

Application of GIS in Disaster Management in India: During any emergency situation, the role of a reliable Decision Support System is very crucial for effective response and recovery. The Geographic Information System provides a most versatile platform for decision support by furnishing multilayer geo-referenced information which includes hazard zoning, incident mapping, natural resources and critical infrastructure at risk, available resources for response, real time satellite imagery etc. GIS-based information tools allow disaster managers to quickly assess the impact of the disaster/emergency on a geographical platform and plan adequate resource mobilization in a most efficient way. Thus, a reliable GIS-based database will ensure the mobilization of the right resources to right locations within the least response time. Such databases would also play a fundamental role in the planning and implementation of large scale preparedness and mitigation initiatives.

The Ministry of Home Affairs has initiated the development of a GIS-based National Database for Emergency Management (NDEM) in collaboration with various Govt. Ministries/agencies such as the Department of space, Department of Science and Technology and ministry of Communications and IT. The ministry with technical support from UNDP, is also in the process of developing GIS based tools for emergency management on pilot basis.

Tsunami Warning Systems: Many cities around the Pacific, notably in Japan but also in Hawaii, have warning systems and evacuation procedures in the event of a serious Tsunami. Tsunamis are predicted by various seismological institutes around the world and their progress monitored by satellites. After 26th December 2004 Tsunami disaster, seven countries including India are being set up with a Tsunami Warning System in the Indian Ocean. Bottom pressure recorders with buoys as communication links are used to detect waves on deep water which would not be noticed by human observer. One system for providing a Tsunami warning is the CREST project (Consolidated Reporting of Earthquakes and Tsunamis) implemented on the West coast , Alaska and Hawaii of the United States by the USGS, NOAA, the Pacific Northwest Seismograph Network, and three other University seismic network. Tsunami prediction remains an imperfect science.

The topography of the sea floor can however give guidance to safe spots. For example, vertical disturbance on an ocean bed infested with mountains is less likely to lead to a destructive Tsunami. This is because a possible Tsunami will partially or completely collapse in the middle of the ocean if it encounters a mountain on its journey to the dry land. No system can protect against a sudden Tsunami. While there remains the potential for sudden devastation from a Tsunami, warning systems can be effective. We need warning systems to prevent loss of life. The warning systems already all over the developed world consist of two components - a network of sensors to detect Tsunamis and a communication infrastructure to issue timely alarms to permit evacuation of coastal areas.

Future Threats of Tsunamis: Although infrequent, Tsunamis are among the among the most terrifying and complex physical phenomena and have been responsible for great loss of life and extensive destruction to property. Because of their destructiveness, Tsunamis have an important impact on the human, social and economic sectors of our societies Historical records show that the enormous destruction of coastal communities throughout the world which has taken place, specifies that the socio-economic impact of Tsunamis in the past has been enormous. Social and economic impact of future Tsunamis will be extremely more serve than that of past events. It is therefore important to plan and prepare for such future events.

Impact on the Marine Environment and Possible Implications: The region harbours many key marine and coastal ecosystems e.g. coral reefs, mangroves, sea grass beds, coastal dunes, mudflats, salt marshes, backwaters and lagoons, which all play a vital role in sustaining the living natural resources on which so many people in this region depend.

Environmental damage to the inter-tidal and sub-tidal area is expected to be extensive. This will include drastic changes in the health of the coastal marine ecosystems, with potentially irreversible destruction of some areas, as well as immediate loss of living from not being able to fish the coastal resources such as fish, lobsters and crabs. This will have serious implications for fisheries, as many fishermen in the region are dependent on near – shore recourses. Many coral reefs may have lost both their structure and bio data, and are now reduced to rubble due to mechanical damage. The force of the Tsunami can move enormous boulders and sections of reef, as well as thousands of tons it smaller fragments, sand and silt, which dislodge, abrade, crush and kill marine biota. Increased turbidity in the wake of a Tsunami will smother and suffocate large areas and kill many organisms that may have survived the wave itself, e.g. on reefs and sea grass beds. This is a very serious consequence that may have everlasting effects. Mangrove areas have been damaged and their fronts may have receded, particularly where they were weakened by e.g. cutting and clearing, and large amounts of debris has been trapped in them. Also there is a potential risk that coral reefs that did not sustain a direct or hard hit by the Tsunami may suffer from the exposure caused by the receding waters it approached, as aerial exposure can stress or even kill corals that are not adapted to it.

Conclusion: With the advancement in Information & Communication Technology (ICT) in the form of the Internet, GIS, Remote Sensing and satellite-based communication links, a great deal of help can be had in the planning and implementation of disaster risk reduction measures. These technologies have been playing a major role in designing early warning systems, catalyzing the process of preparedness, response, recovery and mitigation at all levels. Similarly, GIS-based systems improve the quality of analysis of the hazard vulnerability and capacity assessments, guide development planning and assist planners in the selection of mitigation measures. The Geographical Information System (GIS) data base is an effective tool for the disaster affected areas. The GIS data base already available with different agencies of the Government is being upgraded and the gaps are proposed to be bridged.

The increase availability of Remote Sensing data and GIS during the last decades has created opportunities for a more detailed and rapid analysis of natural hazard. The proper structure of information system for disaster management should be present to tackle the disaster and to manage it. The remote sensing and GIS database can be used to create collaborate and effective Disaster management Information System (DMIS). An integrated approach using scientific and technological advances should be adopted to mitigate and to manage natural hazard. Moreover there should be a national policy for natural disaster management. The first steps have been taken but the end-goal is farther away but in sight now. While Government must provide the lead, private enterprise, NGOs and academia have a major role to play in making the National Spatial Data Infrastructure a reality.

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PHOTOLUMINESCENCE AND CHARACTERIZATIONS OF LaPO4:Eu(1%),Gd(1%) PHOSPHOR FLUXED WITH CITRIC ACID

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Abstract: The present paper reports the effect of the citric acid as a flux on the photoluminescence (PL) properties of 1% of Europium doped $LaPO_4$: Gd (1%) phosphor. The phosphors have been prepared under Standard Solid State Reaction method at 1200° C for 3 hours. The main aim of the paper is to explore the effect of the citric acid as a flux on the emission intensities of $LaPO_{4:}$ Gd, Eu System. Photoluminescence studies such as excitation and emission spectra of un-fluxed and the citric acid fluxed samples and their respective intensities are studied. Both the excitation spectra are monitored at 400 nm and the emission spectra are taken with 254 nm excitation wavelength. For all the practical display device purposes like fluorescent lamp and compact fluorescent lamp, the 254 nm, a mercury resonant radiation in low pressure discharge is used. Hence, by considering the device applications, the 254 nm excitation wavelength is selected for the measurements. The other characterizations like XRD, SEM and FTIR are done on the samples at room temperature. The XRD pattern was compared with JCPDS data and the crystal structure was also determined. The crystallite size was calculated using Scherrer's formula.

Keywords: Phosphor, Synthesis, Photoluminescence, Transition, Solid State Reaction, Excitation and Emission Spectra.

Introduction: The phosphors are widely used in lighting and display devices. The useful applications of rare earth element compounds, especially rare earth doped lanthanide phosphate inorganic materials, have touched upon broadly. Over the past few years, they have been applied in many fields, such as optical display panels, cathode ray tubes (CRT), optoelectronic devices, sensitive devices, nano-scale electronic and plasma display panels (PDP) due to their significant chemical and physical properties. Various solution-phase routes - including solid state reaction, sol-gel, coprecipitation, water oil micro emulsion, polyol-mediated process, ultra sonification, hydrothermal and mechano chemical methods have been tried to lower the reaction temperature and obtain high quality $LaPO_4$ based nanoparticles. However, the simple and mass fabrication of $LaPO_4$ nanocrystals with narrow grain size distribution and uniform morphology still remains a challenge. It appears that the best solution to control powder morphology and to produce low cost thin films is the use of soft chemistry routes. We adopted the standard solid state reaction technique to prepare $LaPO_4$ phosphor to obtain good morphologies and fine crystal structures and its excitation and emission intensities of luminescence are also studied.

Materials And Method:

Synthesis: Lanthanum Oxide (La_2O_3), Ammonium dihydrogen Orthophosphate ($NH_4H_2PO_4$) were taken as base materials in a molecular stoichiometry of 2:1. Gd_2O_3 and Eu_2O_3 with fixed molecular weight of 1.0% each were added to it as dopants. They were weighed and taken into an agate mortar and pestle mixed, ground thoroughly for 45 minutes to get fine powder. Acetone is added intermediately in grinding procedure to get small and uniform particle size. Both the un-fluxed and the citric acid fluxed compounds were fired separately in a muffle furnace with a heating rate of 6^{o} C per minute, up to the temperature of 1200^{o}C for 3 hours in the open atmosphere.

Results and Discussions:

PL Study:

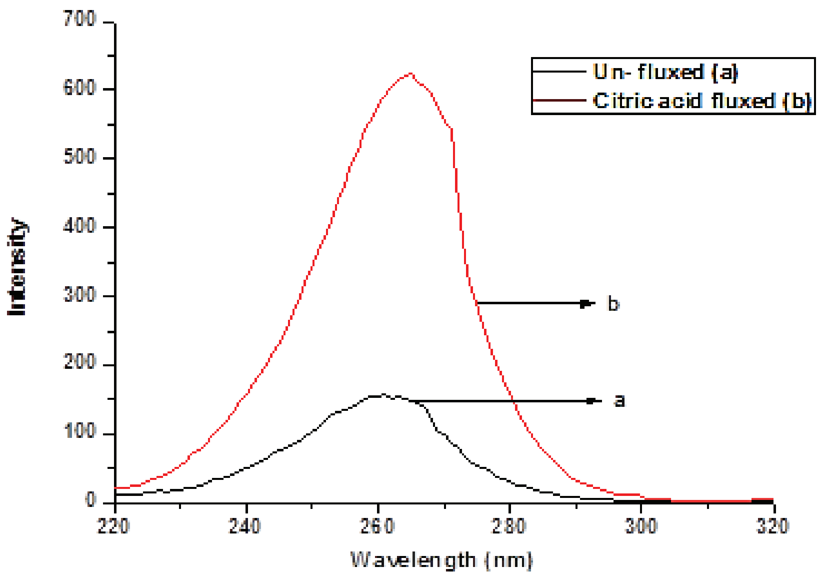

Fig. 1: Excitation spectra of $LaPO_4$: Gd (1%), Eu (1%) without and with citric acid as a flux

Fig.1 shows emission spectra of $LaPO_4$: Eu1% andGd1% monitored at400nm for un-fluxed and the citric acid fluxed samples respectively. A broad Spectrum ranging from 220nm to 300nm, which peaks around 265 nm with good intensity is observed for the both samples. The citric acid doesn't alter the basic emission spectrum, bt the intensity is increased around 5 times.

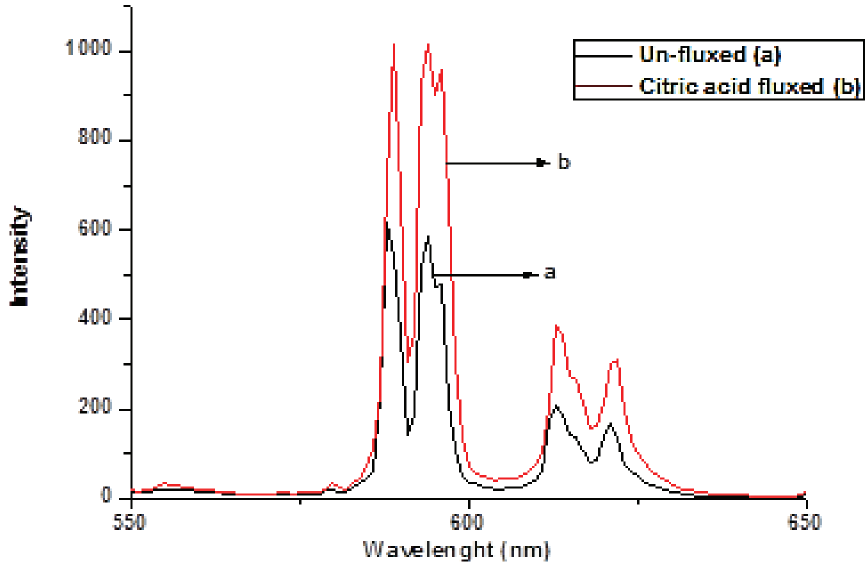

Fig. 2: Emission spectra of $LaPO_4$: Gd(1%), Eu(1%) without and with citric acid as a flux at 254 nm Ex.

Fig.2 is the emission spectra of $LaPO_4$: Eu1% andGd1% at an excitation wavelength of 254nm for un-fluxed and the citric acid fluxed samples. For all practical display device purposes like fluorescent lamp and compact fluorescent lamp, the 254 nm, a mercury resonant radiation in low pressure discharge is used. Therefore, by considering the application potential of this phosphor, the present set of Photoluminescent measurements is taken at the excitation of 254 nm, even though the maximum absorption band is around 265 nm. It should be noted that the 254 nm falls within the absorption band of $LaPO_4$: Eu (1%), Gd (1%). From the figure,the peaks found in yellow region are at 588 and 594nm wavelengths with good intensity, which are allowed transitions from magnetic dipole component from the crystal arises from Eu^{3+} ion. The emissions in the red region (613 and 621 nm) grow at the same phase. The emission intensities of all the peaks in yellow and red regions are almost $3\frac{3}{4}$ times when excited with 254 nm. The emission band in the red region attributes to hyper sensitive electric dipole component of the crystal arises from Eu^{3+} ion. The emission intensities of the yellow band and red band in the citric acid fluxed sample verywelly increased and the emissions in the yellow region goes out of the range of the machine greater than 1016 units.from the figure, we can conclude that the role of the citric acid as a flux increases the photoluminiscent emissions to almost double.

Fig. 3 shows the XRD pattern of the $LaPO_4$: Gd (1%), Eu (1%) phosphor prepared without flux. From the figures it is clearly observed that the maximum peak obtained is at 28.49°. The calculated crystallite size using Scherer's formula $d = K.\lambda / \beta \cos\theta$, where 'K' is the Scherer's constant (0.94), 'λ' the wavelength of the X-ray (1.5418 Å), 'β' the full-width at half maxima (FWHM) (0.3444), 'θ' the Bragg angle of the highest peak and for $LaPO_4$: Gd (1%), Eu (1%) is around **24.86 nm**. From XRD pattern, it is found the phosphor may not be in single phase.

Many crystallites agglomerate together and form a particle. The average calculated crystallite size for all the observed peaks seen in tbe figre is **28.9078 nm.**

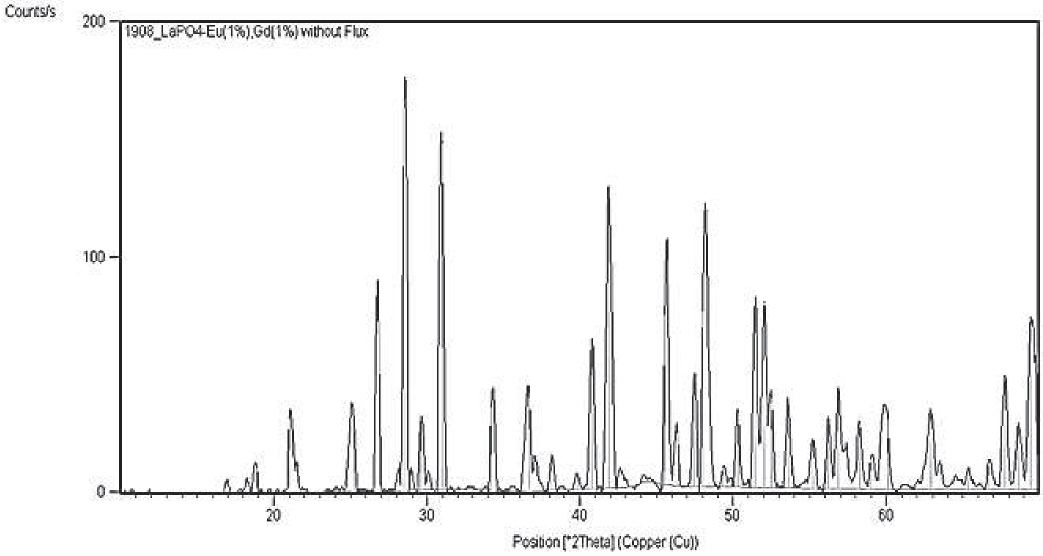

Fig. 3: XRD of $LaPO_4$: Eu (1.0%), Gd (1.0%) without Flux

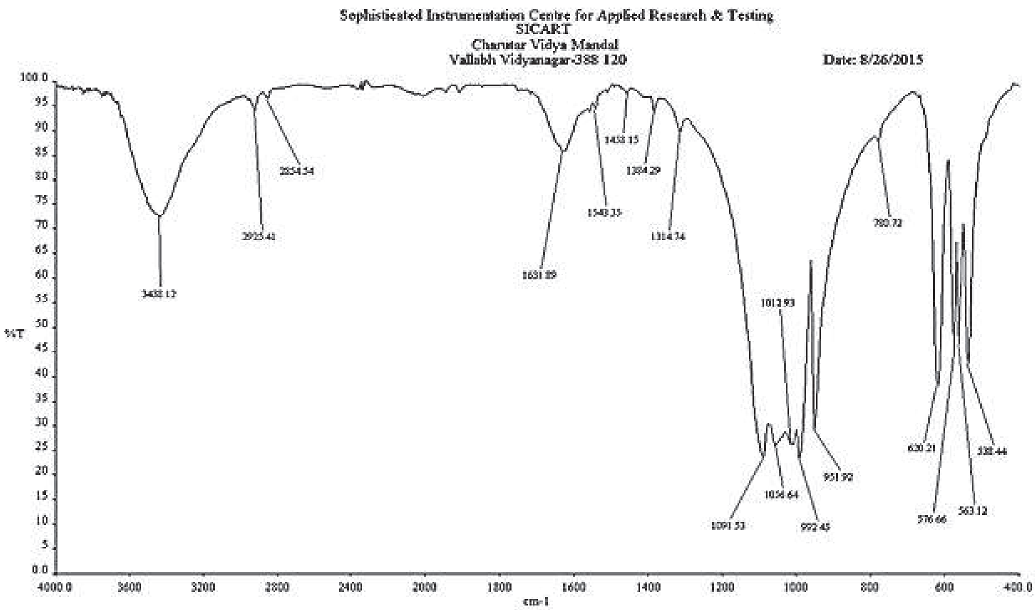

Fig.4: FTIR of $LaPO_4$: Eu (1.0%), Gd (1.0%) without Flux

Fig. 4 shows the FTIR spectrum of $LaPO_4$: Eu (1%), Gd (1%), phosphor prepared without flux. From the figure, the most of the observed peaks are at 3625, 2375, 1425, 850, 650, 500 cm^{-1}. From FTIR it is observed that most of the bands are due to C-O, Gd-O, La-O, Eu-O and the O-H stretching band is observed at 3625cm^{-1}. The band around 3625cm^{-1} is due to the H-OH stretching of absorbed water molecule from the atmosphere.