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Chapter 12

# Analysis and Comparison of Psychological Constraints Among Various Countries During COVID-19

**Tanu Rizvi**
*Shri Shankaracharya Technical Campus, Bhilai, India*

**Devanand Bhonsle**
*Shri Shankaracharya Technical Campus, Bhilai, India*

**Ruhi Uzma**
*Anjuman College of Engineering and Technology, India*

## ABSTRACT

*Behavior of any human is mostly permanent as per their personality, but it gets influenced by a variety of factors originating psychologically and socially. However, some temporary factors such as attitude, surroundings, instant mood, culture, etc. may hamper behavior severely. Researchers have published many articles depending upon human behavior and its approach. This study is aimed to describe the effect of external parameters on human behavior in Indians as well as Europeans due to COVID-19 outbreak globally. This study is a survey made on online platform in Indian premises and studies carried by researchers in four European countries: UK, France, the Netherlands, and Denmark. Comparisons have been done with different levels and parameters between India and European countries. This chapter not only concludes the psychological constraints but also the good habits adopted by peoples during COVID-19 pandemic to have a safer future.*

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## ABOUT THE AUTHORS

**Dr. Tasneem K.H. Khan** is working as Assistant Professor with Anjuman College Of Engineering & Technology, Nagpur (NAACAccredited). She is having 18 years of teaching experience. She did her Ph.D from Rashtra Sant Tukadoji Maharaj Nagpur Universit , Nagpur . Her area of interest is Medicinal Chemistry and Environmental Chemistry. Number of research papers have been published in journals and conferences.

**Dr. Dilipkumar Bhupenchandra Rana** is having teaching experience of 15 years that includes 13 years in Engineering and 2 years in Science College. Presently he is working as Associate Professor in S. B. Jain Institute of Technology, Management and Research, Nagpur (NAAC Accredited with "A" Grade). He has served as environmental analyst in Environment Division of Ambuja Cements Pvt. Ltd. at Chandrapur, Maharashtra. He also worked as "R & D" (Research and Development) chemist in a drug manufacturing unit in Chandrapur, Maharashtra.
His specialization is Physical Chemistry and elective as Environmental Chemistry. His Ph. D work in "Greywater i.e. domestic waste water treatment won national and international prizes. His portable greywater water system has been awarded by a Copyright by Government of India.

**Dr. Gaurav Bhosekar** has teaching experience of 12 years in engineering colleges and 1 work experience in industry. Presently he is working as Assistant Professor in Jhulelal Institute of Technology, Nagpur. He has also worked as a Project Assistant at National Chemical Laboratory, Pune for 2 years.
He has received Ph.D degree from University of Kiel, Germany. He is specialized in Inorganic and Industrial Chemistry. His work focuses on Inorganic Solid State Aspects of Coordination Polymers: Synthesis, Structure and Properties of New Transition Metal Complexes.
He has published 14 research papers in various international journals. Also, he has presented papers in various International and National conferences. He has received financial aid for his research work from BCUD, SP University of Pune.

**Dr. Mrs. Archana P. Shetye** is having teaching experience of 11 years. Presently, she is working as an Assistant Professor at Priyadarshini Indira Gandhi College of Engineering, Nagpur. She has completed her M. Sc. (Organic Chemistry) and Ph.D. from Swami RamanandTeerthMarathawada University, Nanded. Her research interest is in Hetercyclic Compounds and she has published 5 International Journal publications and 35 National Journal publications.


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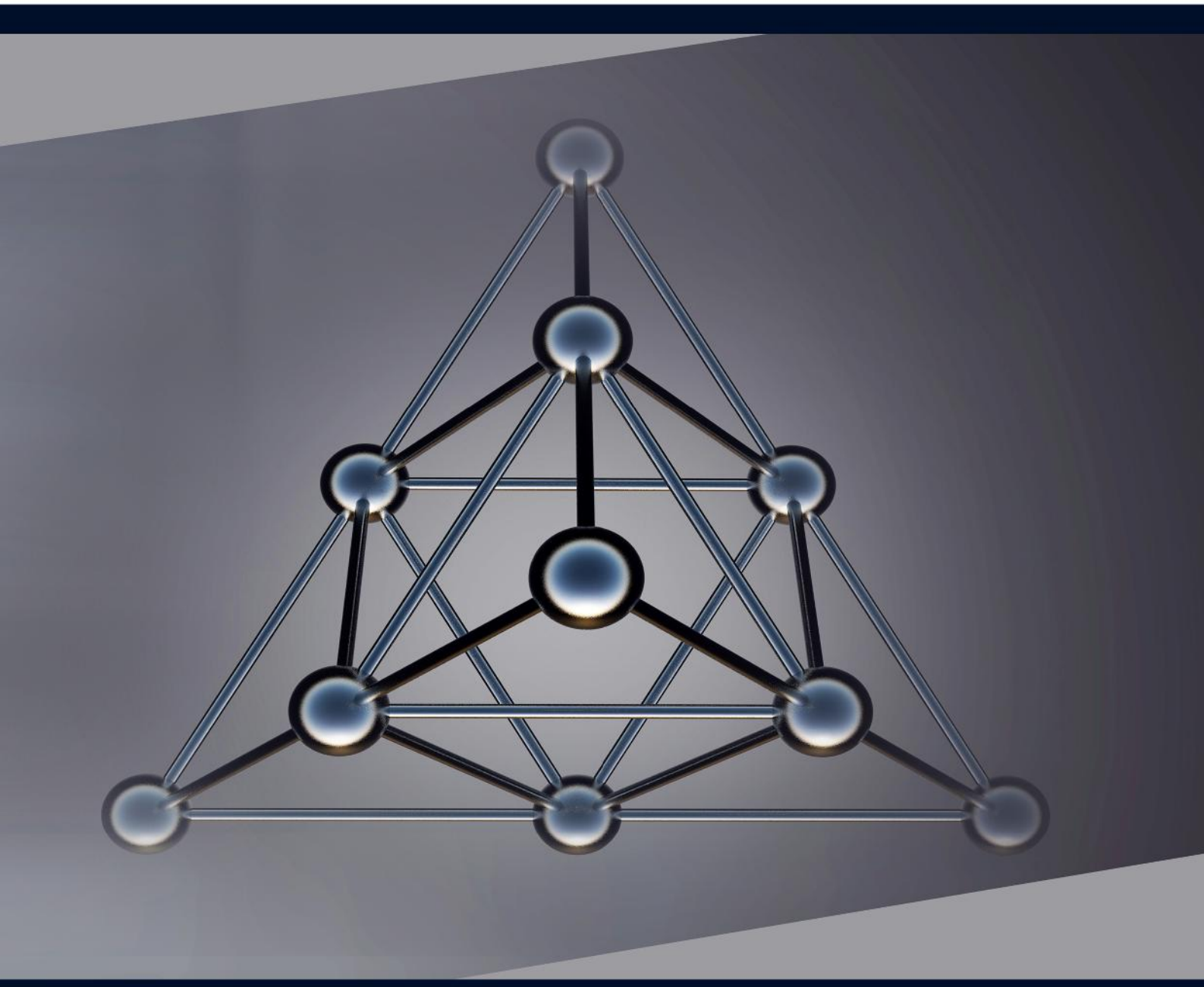
## Vol. 6



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# New Trends in Physical Science Research

## Vol. 6

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## Vol. 6

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# *Contents*

## *Preface*

*This book covers key areas of Physical Science. The contributions by the authors include intrinsic frequency, Membrane technology, helical symmetry, mass density, schrodinger equation, Electromagnetic radiations, photoelectric effect, fuzzy quantum probability, fuzzy wave function, membership function, membership degree amplitude, fuzzy probability amplitude, validation accuracy, coronavirus infection, Bernstein inequality, Erdös-lax inequality, polynomials, maximum modulus, Evaporation, crystal growth, electro-optics, Maredan clay, heterogeneous catalyst, biodiesel, photocatyalatic activity, viscosity, nuclear fusion, Euler's equation, astrophysics, electromagnetic interaction, particle physics, classical color theory, Azimuthal distributions, anode blocks, vacuum microwave sources, collision regulations, multiple ship situations, gravity quantization, cosmological constant, dark energy, dark matter, Binary asteroid, surface equilibrium, surface dynamics, surface mass shedding, Newton gravitational constant, angular velocity, cosmology, extended space model, gravitational impact, non-zero vacuum pressure. This book contains various materials suitable for students, researchers and academicians in the field of Physical Science.*

***Chapter 5***
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# Effect of Glycine Dopant on FTIR Spectrum of Ammonium Dihydrogen Phosphate (ADP) Crystal Grown by Slow Evaporation, Rotation and SR Methods

**A. Z. Khan [a*ϕ] and Z. S. Khan [bϕ]**

DOI: 10.9734/bpi/ntpsr/v6/2314A

## ABSTRACT

Diverse molar concentrations of Ammonium Dihydrogen Phosphate crystals doped with Glycine (GADP) have been generated using different processes, including slow evaporation, rotation, and Sankaranarayanan - Ramasamy (SR) procedures. ADP crystals have found many applications in Non-linear optics, electro-optics, and transducer devices. On the developed GADP crystals, the Fourier Transform Infrared (FTIR) researches have been widely examined. The extra peaks in the FTIR spectrum that correspond to the functional groups of Glycine reveal the interaction between ADP and the dopant. The presence of all functional groups in the substance is confirmed by FTIR's standard spectrum statistics. When compared to the conventional slow evaporation method created Glycine doped ADP crystals, the spectra for ADP crystals doped with Glycine grown by Rotation and SR procedures had identical peaks with minimal variance.

*Keywords: Evaporation, crystal growth, electro-optics, ADP Crystals*

## 1. INTRODUCTION

In material science and engineering, crystal growth is a fundamental concept. The vast majority of crystal growth research has focused on practical approaches rather than hypothetical exploration. For the manufacture of greater efficiency PV cells for surrogate energy, advancements in crystal formation are critical. For initial data acquisition and devices utilized for practical purposes such as ICs and sensors, crystals of the necessary diameter and precision are required. Adding small previously prepared crystals to the prepared solutions provides nucleating sites. A single seed crystal would result in a larger crystal [1-2]. Depending on the phase conversion method, techniques of crystal growth can be classified as growth from solid, vapour, melt and solution [3]. The various methods of solution growth are studied by many researchers [4]. As the crystal growth is conceded at the room temperature, the structural impurities in the crystals grown by solution method are quite less [5].

Ammonium Dihydrogen Phosphate crystals have been extensively used as the $2^{nd}$, $3^{rd}$ and $4^{th}$ harmonic generators for different laser applications which require short pulses of laser. ADP crystals have found many applications in Non-linear optics, electro-optics, and transducer devices. It is also used as Monochromator in X-ray fluorescence investigation. Numerous researchers have studied properties of pure and doped Ammonium dihydrogen phosphate crystals [6-7]. Amino acids with various molar concentrations have been used as an additive to grow ADP crystals [8]. Glycine ($NH_2CH_2COOH$) is considered to be the simplest amino acid among the 20 protein amino acids. In this research module; we have used amino acid Glycine as an additive in ADP in different

*ϕ Assistant Professor,*
*[a] Yeshwantrao Chavan College of Engineering, Nagpur, India.*
*[b] Anjuman College of Engineering & Technology, Nagpur, India.*
***Corresponding author: E-mail: arsalazamirkhan@gmail.com;***

molar concentrations. We have employed slow evaporation growth method, crystal rotation method and Sankaranarayana-Ramasamy method to grow pure and glycine doped ADP (GADP) crystals.

## 2. SYNTHESIS OF G-ADP CRYSTALS

ADP crystals have been grown by the method of conventional slow evaporation. Calculated amount of Ammonium Dihydrogen Phosphate (GR-grade) was dissolved in the water. Aqueous solution containing Ammonium dihydrogen phosphate was made based on the solubility curve of salt at the constant temperature under saturation state. Magnetic stirrer was used for stirring the solution. The solution was then stirred constantly for 8 hours to attain stability. Filter paper of 11µm dimension and filtration pump was used to filter the prepared solution.

The above process was repeated for calculated mole % of Glycine (Merck) dopant which was dissolved in Ammonium dihydrogen phosphate solution. Crystals of ADP and GADP with optically superior quality have been grown in the span of 20 - 30 days. The photographs of ADP and GADP crystals have been shown in Fig. 1.

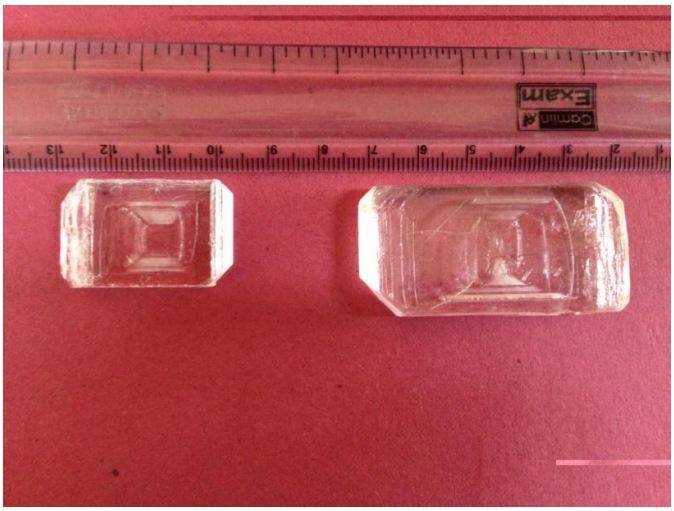

**Fig. 1. Photographs of GADP (left) and ADP (right) crystals**

G-ADP crystals have been also grown by crystal rotation method and Sankaranarayanan-Ramasamy (SR) method [9].

### 2.1 FTIR Spectral Analysis

The grown crystals were grounded in pestle mortar to get fine powder. The fine powdered samples were then utilized for FTIR Spectral Analysis. Fourier Transform Infrared (FTIR) spectrum shows a fingerprint of the material with the peaks that correspond to the vibrational frequencies amongst the bonds of the atoms building up the substance. In IR spectroscopy, Infrared rays are allowed to pass through a target material. Several IR rays are absorbed by the material but few of them are transmitted through it. The ensuing spectrum thus represents the structural fingerprint of the material. Similar IR spectrum could not be produced by two distinctive molecular structures thus making IR spectroscopy helpful for various types of quantitative examinations.

## 4. RESULTS AND DISCUSSION

The Fourier Transform Infrared (FTIR) studies have been done on the crushed samples of pure Ammonium Dihydrogen Phosphate and Glycine doped ADP crystals. The FTIR spectra were observed in the region 400 to 4000 $cm^{-1}$ with the use of KBr pellet. The standard spectra of functional

group were used to match the functional groups of pure and doped ADP crystals have been acknowledged. Functional groups of Pure ADP and Glycine doped ADP (GADP) crystals developed by conventional slow evaporation methods with different concentrations [1M% - 6M%] are shown in Fig. 2.

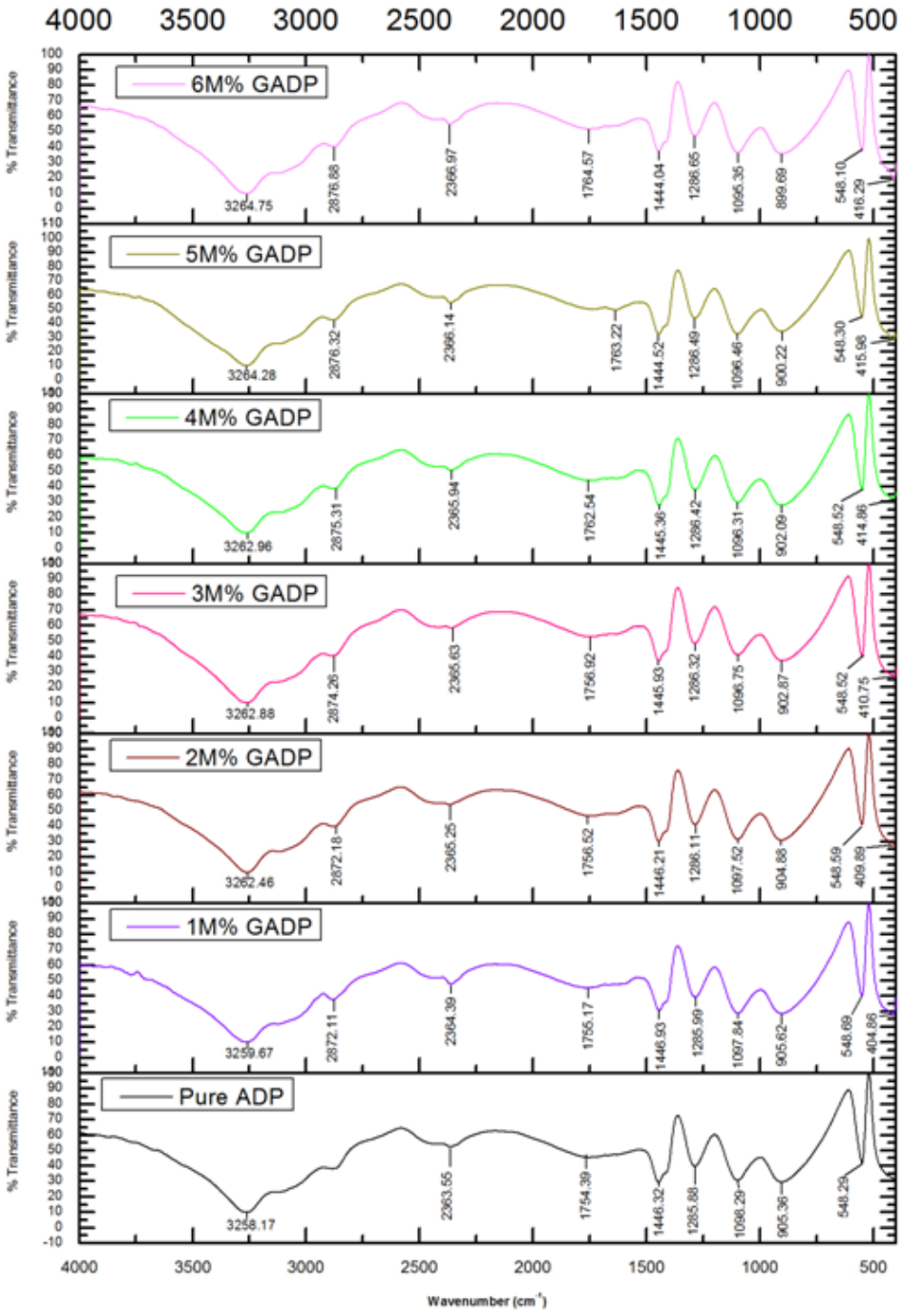


**Fig. 2. FTIR Spectrum of ADP and GADP with various concentrations**

The spectra reveal the interface between ADP and protein amino acid through the supplementary peaks which correspond to the functional groups of Glycine [10]. Standard FTIR spectrum statistics verifies all the functional groups present in the crystal. The above FTIR graph shows variations in the absorption frequencies due to variation in the bond length between O-H and P=O. Owing to the

variation in the bond length between P=O and O-H, change in the wave number ($cm^{-1}$) was observed in FTIR spectrum. Owing to the feeble force of attraction amongst the P=O and O-H bonds, optical characteristics of pure and doped Ammonium Dihydrogen Phosphate crystals are modified [11]. Amino acid doped ADP crystals were studied by many researchers [12-13]. Observed reallocation in the positions of the peak of $PO_4$ and P-O-H vibrations in the FTIR spectra confirms the interaction of ADP and amino acids. The FTIR spectra of pure ADP and GADP crystals have been shown in Fig. 2. In this research module, the FTIR spectrum of ADP shows that the O-H stretching vibration of $H_2O$ was observed at 3258.17 $cm^{-1}$ and $CH_2$ stretching mode just below 3000 $cm^{-1}$. Stretching of P-O-H at wave number 1098.29 $cm^{-1}$ and ammonia N-H stretching at wave number 2363.55 $cm^{-1}$ was observed. The peaks at 548.29 and 405.5 $cm^{-1}$ show $PO_4$ vibrations and these results agree with the reported results [14-15].

The FTIR spectrum of Glycine (1, 2, 3, 4, 5 and 6 mole %) doped ADP (GADP) crystals disclose that due to the existence of Glycine into Ammonium Dihydrogen Phosphate, the position of the peaks have been moved to other wave numbers. The $PO_4$ vibration of the ADP is moved from 405.5 $cm^{-1}$ to a maximum value of 416.29 $cm^{-1}$. Likewise, vibrations of P-O-H at 1098.29 and 905.36 $cm^{-1}$ of the ADP are moved to lower side i.e. 1095.35 and 899.69 $cm^{-1}$, which confirms the existence of Glycine in the ADP crystal lattice [16].

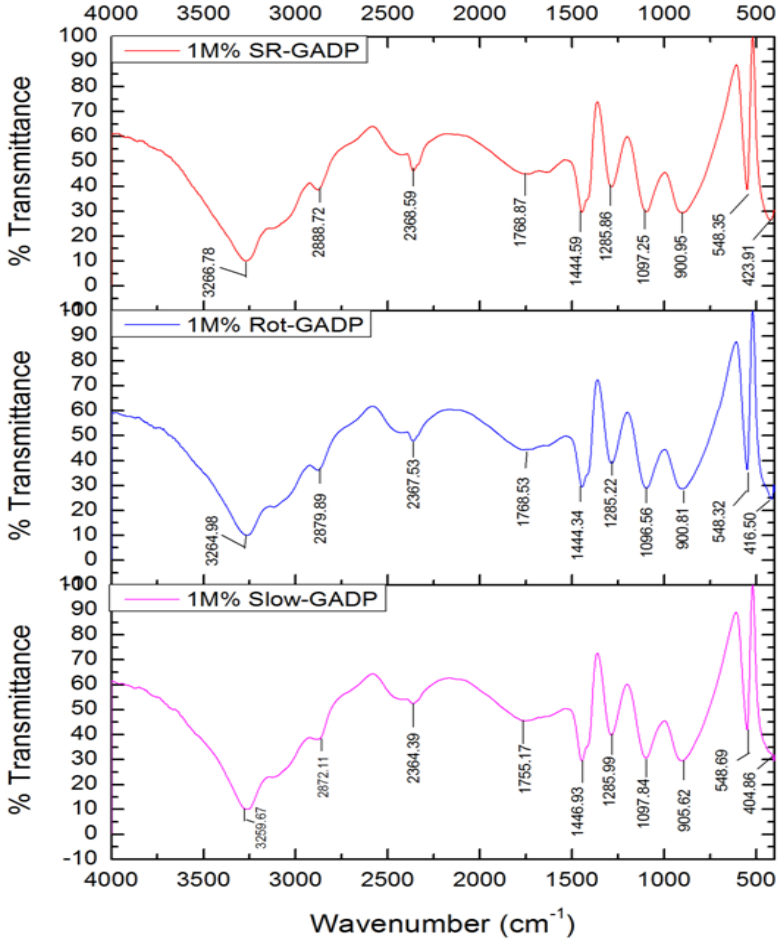


**Fig. 3. FTIR spectrum of glycine (1M%) doped ADP crystal by different methods**

Functional groups of Glycine doped ADP crystals grown by different methods are shown in Fig. 3. C = O stretching of –COOH group is assigned in the absorption range 1700-1800 $cm^{-1}$ and $CH_2$ vibrations

of glycine give their peak in the range 2872.11 to 2876.88 $cm^{-1}$ which are missing in pure ADP spectrum [17]. Due to high concentrations of dopant, the -NH group hydrogen stretching which was observed at wave number 3500 - 3000 $cm^{-1}$ is broadened to some extent. Some kind of interaction amongst -NH group of the ADP and the dopant is indicated by the shifting of peak from 2363.55 $cm^{-1}$ to a maximum value of 2366.97 $cm^{-1}$ [12]. The spectrum for Glycine doped (1M%) ADP crystals (Fig. 3) grown by Rotation (Rot-GADP) and SR (SR-GADP) methods also have similar peaks with minor difference as that of slow evaporation (Slow-GADP) method grown Glycine doped ADP crystals with slight variations. The $PO_4$ vibration of 1M% GADP crystal developed by slow evaporation, rotation and Sankaranarayanan-Ramasamy methods are found to be at 404.86, 416.50 and 423.91 $cm^{-1}$ respectively. Also, the P-O-H vibrations are found at 1097.84 and 905.62 $cm^{-1}$ for 1M% Slow GADP, 1096.56 and 900.81 $cm^{-1}$ for rotation and 1097.25 and 900.95 $cm^{-1}$ for SR method grown GADP crystals, which again confirms that Glycine is present in ADP crystals. $CH_2$ vibrations of glycine give their peak at 2872.11, 2879.89 and 2888.72 $cm^{-1}$ for slow, rotation and SR grown GADP crystals respectively. The vibration frequencies shows that hydrogen bonding results in O-H group stretching frequencies of ADP and COOH group of Glycine [18-19].

## 4. CONCLUSION

The Fourier Transform Infra-Red (FTIR) analysis was performed on the grown ADP samples. The effect of Glycine used in this research module on the vibration frequency assignments of functional groups of ADP and GADP crystals have been recognized by Fourier Transform Infrared (FTIR) Spectroscopy. Matching of functional groups with the standard spectrum was done. The FTIR spectra validate the interaction between ADP and the dopant by the extra peak which corresponds to the functional groups of Glycine. The peaks analogous to C = O stretching of –COOH group and $CH_2$ vibrations of glycine confirms the incorporation of dopant into the ADP crystal lattice. The variation in the values of SR grown GADP crystal shows that it can modify the transparency and strength of the Ammonium Dihydrogen Phosphate crystals, better than the crystals grown by slow evaporation and rotation methods. Fourier Transform Infrared (FTIR) spectra of the specimens validate the presence of functional groups in them.

## COMPETING INTERESTS

Lot of basic science owing to the property of the crystal depends on the production of high-quality crystals with reasonable size. Buckley (1951) has elegantly put the matter, “It should be remembered that, in the preparation of large crystals, the touch of the artist is about as important as the application of established scientific principles." The role of Glycine on the quality and growth rate of ADP crystal grown in conventional method, rotation method and SR method has been studied and it showed that the properties of the crystals are enhanced. More properties like HRXRD, piezoelectric studies and NMR can be studied to exploit these types of crystals in various applications. The effect of some more amino acids doped unidirectional crystals can be attempted.

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**Biography of author(s)**

**Dr. A. Z. Khan**
Yeshwantrao Chavan College of Engineering, Nagpur, India.

**Research and Academic Experience:** 17 years.

**Research Area:** Crystal Growth, Dielectric Relaxation Study, Material Growth and Characterization.

**Number of Published papers:** Published 09 research papers in International and National Peer reviewed Journals.

**Special Award:** Received Summer Research Fellowship at Crystal Growth Centre, SSN College of Engineering, Chennai by IISC, Bangalore from May 2009 – June 2009.

**Any other remarkable point(s):** Awarded Ph.D. (Physics) in the year 2017. Participated in several international conferences/seminars/FDP/STTPs within India. Has 4 copyrights to her credit and published a book chapter in an edited book. Handled important portfolios such as Head of Applied Physics Department, First Year Coordinator, Exam In-charge, Member of NAAC Steering Committee, First Year NBA In-charge, Admission Committee In-charge, Convener of different workshops organized at college level and delivered Guest lectures at other renowned institutes.

**Z. S. Khan**
Anjuman College of Engineering & Technology, Nagpur, India.

**Research and Academic Experience:** 14 years.

**Research Area:** Dielectric Relaxation Study, Crystal Growth, Material Growth and Characterization.

**Number of Published papers:** Published 07 research papers in International and National Peer reviewed Journals.

**Special Award:** Received Summer Research Fellowship at Crystal Growth Centre, SSN College of Engineering, Chennai by IISC, Bangalore.

**Any other remarkable point(s):** Handled important portfolios such as Head of Science and Humanities Department, Member of NAAC Committee, Admission Committee In-charge, Member of different workshops organized at college level and delivered Guest lectures at other institutes.



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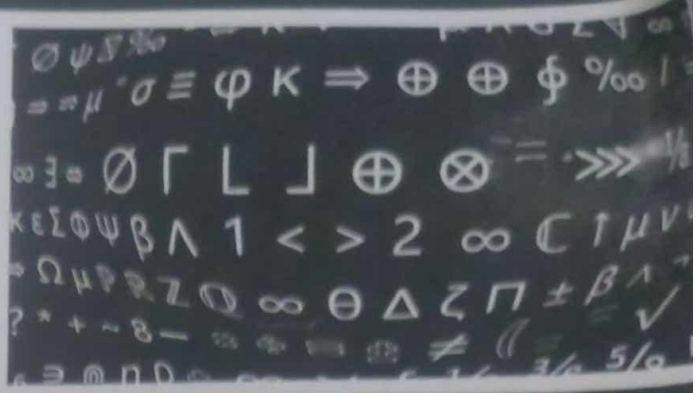

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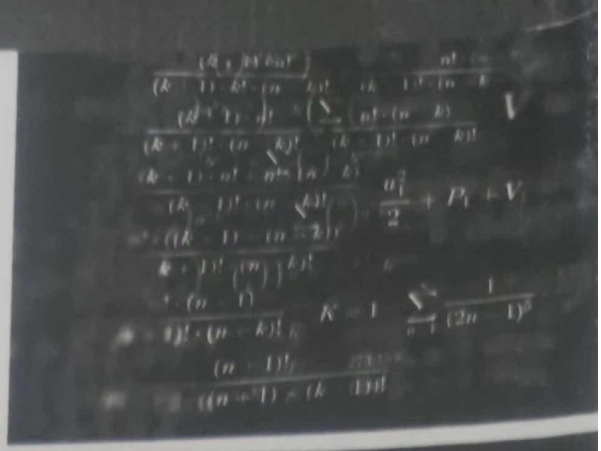

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No. Acad/Dir/2022/245 Date, 17th March, 2022

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It is notified for general information of all concerned that the following persons are hereby nominated by the Board of Studies & Ad-hoc BOS on the committee to be constituted by the Board of examination and Evaluation Under section 48(3)(a) (iv) of Maharashtra Public University Act, 2016 to appoint paper setters, Examination and Moderation, mentioned against their name in its annual meeting held in the month of April, 2020.

The term of the following nominated members shall be as per section 62(2) & 63 of Maharashtra Public University Act, 2016 i.e. up to 31st August, 2022.

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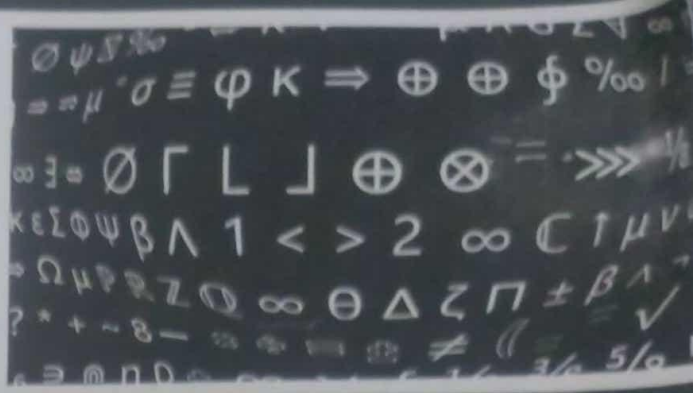

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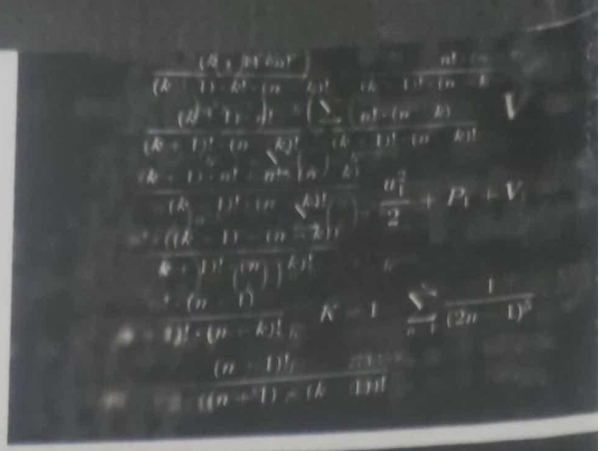

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**Tanveer Quazi**
M Sc (Physics), Ph. D., Anjuman College of Engineering and Technology Nagpur
Dr. Tanveer Quazi, Assistant Professor in Physics, Anjuman College of Engineering and Technology Nagpur, has 15 years of teaching Experience and published 19 research papers in International and national journals and conference proceedings. He has participated inand presented 22 research papers in various international and national conferences across India and abroad. He has worked on DRDO research Fellowship, received Visiting Scientist Fellowship- ICTP Federation Scheme (Funded by UNCSCO and IAEA)), Trieste, ITALY and was awarded INSA-DST FELLOWSHIP For SRF (National Science Academy). He has also worked at BARC Mumbai. His area of research includes Physics and Materials Science.

**Jasmirkaur Randhawa**
M Sc (Physics) Ph.D., Government College of Engineering Nagpur
Dr (Ms) Jasmirkaur Randhawa, Assistant Professor in Physics, Government College of Engineering Nagpur has 22 years' experience of teaching Physics at Engineering and M Sc Physics. Her research interestsare Electrochemical Gas Sensors, Composite materials and Impedance Spectroscopy. She is recipient of Prof. Suresh Chandra Medal for Best Paper Presented in 4th National Conference on Solid State Ionics, IIT Bombay. She has completed MODROBS project on materials' electrical characterization. She has published 18 research papers in National and International Journals and conference proceedings, an international book chapter and edited a book. She is granted a patent on CO2 sensor.

Uma Gaikwad, MSc(Physics), B Ed, PhD (pursuing)
Priyadarshini Bhagwati College of Engineering, Nagpur.
Mrs. Uma V. Gaikwad, Assistant Professor in Physics, Priyadarshini Bhagwati College of Engineering Nagpur, has over 18 years of teaching Experience. She has published papers in International, national journal and two book chapters have been published in Apple Academic Press, CRC, Taylor and Francis. She has participated and presented research papers in various international and national conferences across India. Her area of research includes Physics and Materials Science.

**Smita C. Tolani, M.Sc. (Physics), MBA (HR), B.Ed, PhD (pursuing)**
**St. Vincent Pallotti College of Engineering and Technology Nagpur**
Ms. Smita Chandar Tolani, Assistant Professor in Applied Physics, St. Vincent Pallotti College of Engineering And Technology Nagpur is recipient of Ram Chandra Chandurkar Gold Medal, K. L Seth Gold Medal, National Crystallography Award, and P. L Khare Prize in Physics. She has 16 years of teaching experience and number of publications in reputed journals, National/International conferences. She has authored a book and wrote chapters in three reputed national book publications on Physics, Research and Management. She is a columnist and writes for local newspapers. Her areas of interests include Solid State Physics, Materials Science, Vedic Mathematics, HR Management.

**Prashant Ambekar, M.Sc. (Physics) M. Phil, Ph. D.**
**Dharampeth M. P. Deo Memorial Science College Nagpur**
Lt. Dr. Prashant Ambekar, Assistant Professor in Physics, Dharampeth M. P. Deo Memorial Science College, Nagpur since 2003 has 23 years of research and teaching experience. He has received SRF (Direct Awardee) CSIR, New Delhi and Summer Research Fellowship jointly awarded by IAS, Bangalore, INSA, New Delhi and NASI, Allahabad for three times. He has completed two minor research projects of UGC WRO, Pune and published 21 papers at National/International journals and conferences and authored an international book chapter (Taylor and Francis). He is granted a patent on CO2 sensor. He has designed and developed instruments for UG/PG laboratories. His research interest includes Electrochemical gas sensors, photocatalytic water splitting, DSSCs and nanomaterials.

**Shahin Sayyad, M Sc (Physics) Ph D**
**Shri Shivaji Science College Amravati**
Dr. Shahin Sayyad is working as an Assistant Professor with Shri. Shivaji Science College, Amravati. She has teaching experience in Engineering and Science Colleges. She hasvpublished research papers inreputed International and national journals. She has participated and presented research papers in various international and national conferences across India and abroad. She has received MANF Fellowship during her doctoral research work.



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## ABOUT THE AUTHORS

**Dr. Tanveer Quazi,** Assistant Professor in Physics, Anjuman College of Engineering and Technology Nagpur, has 15 years of teaching Experience and published 19 research papers in International and national journals and conference proceedings. He has participated and presented 22 research papers in various international and national conferences across India and abroad. He has worked on DRDO research Fellowship, received Visiting Scientist Fellowship- ICTP Federation Scheme (Funded by UNCSCO and IAEA)), Trieste, ITALY and was awarded INSA-DST FELLOWSHIP For SRF(National Science Academy). He has also worked at BARC Mumbai. His area of research includes Physics and Materials Science.

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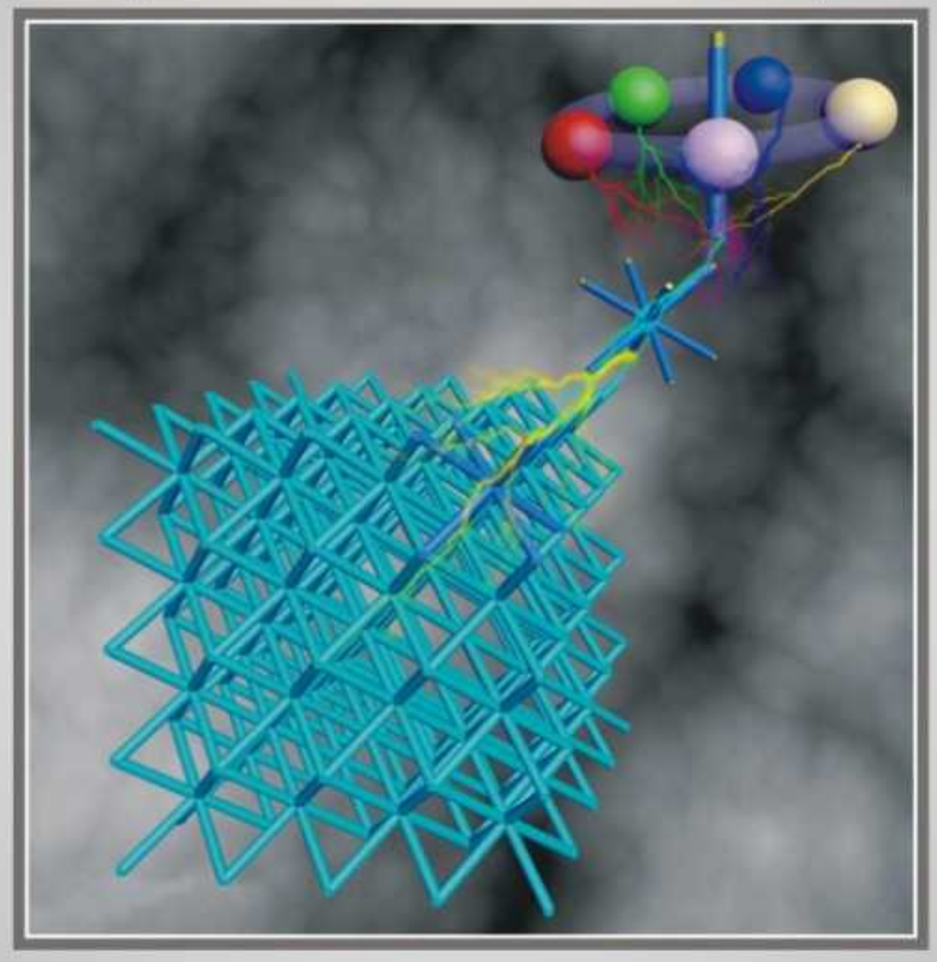


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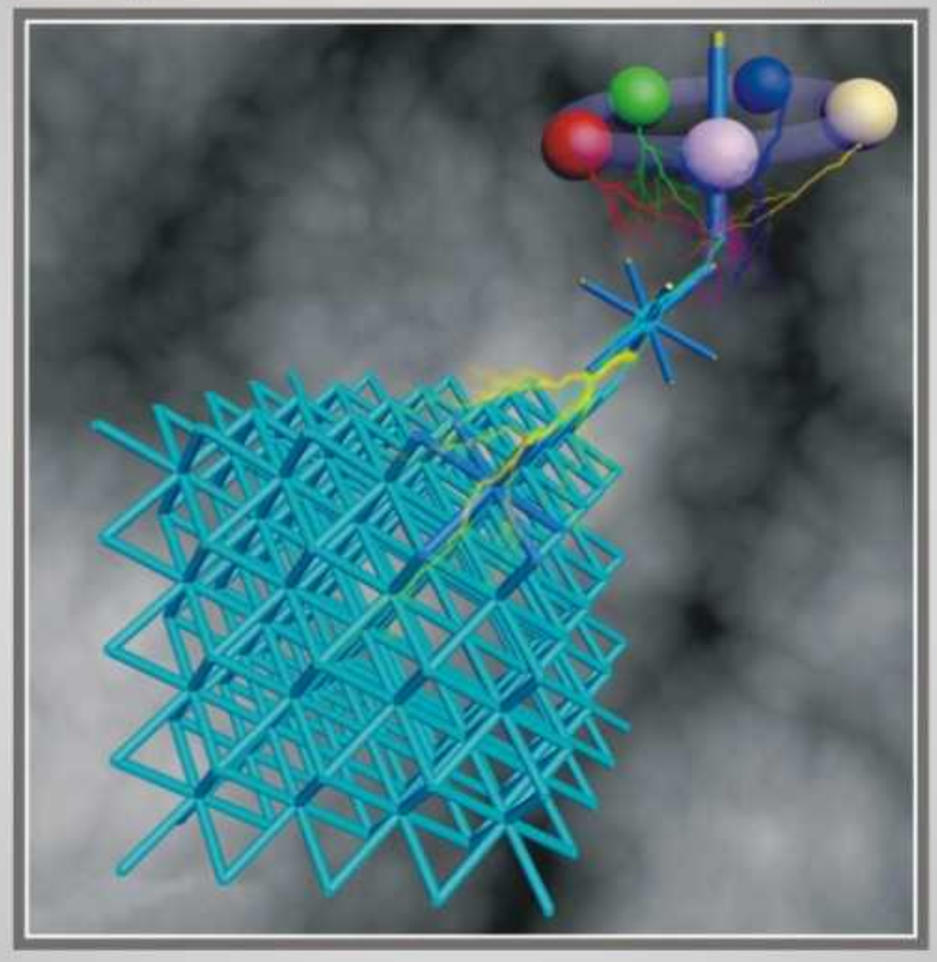


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