EASTERN KARBI ANGLONG COLLEGE

Affiliated to Assam University

CRITERIA 3- RESEARCH, INNOVATIONS AND EXTENSION

3.2.2 Number of books and chapters in edited volumes/books published and papers published in National/International Conference proceedings per teacher during last five years.

23/1/22
Dr. Anil Ch. Das, Principal
Eastern Karbi Anglong College
Sarihajan, Karbi Anglong.

1. The images of the book chapters of Dr. Himani Medhi are as follows:

Faraday Discussions

Cite this: Faraday Discuss., 2018, 207, 389

DISCUSSIONS View Article Online View Journal | View Issue

Light induced damage and repair in nucleic acids and proteins: general discussion

Amitava Chandra, Richard Cogdell, Carlos E. Crespo-Hernández, Ankona Datta, Angelo Giussani, Stefan Haacke, John Helliwell, Roberto Improta, Ramapurath S. Jayasree, Mike Jones, Tolga Karsili, Bern Kohler, Mahil L. Imon Mandal, Dimitra Markovitsi, Himani Medhi, Padmaja P. Mishra, P. I. Pradeepkumar, Priyadarshi Roy Chowdhury, Manas Sarangi, Igor Schapiro, Ilme Schlichting, Javier Segarra-Martí, Amit Sharma, Vishnu V, Rienk van Grondelle and Anthony Watts

DOI: 10.1039/C8FD90006J

Bern Kohler opened discussion of the paper by Mike Jones: What about charge transfer as a possible explanation for the emission quenching you observe with the cadmium telluride quantum dots?

Mike Jones answered: So far the data we have are consistent with a FRET mechanism, but we cannot rule out the involvement of charge transfer states. Professor Rienk van Grondelle has suggested we use Stark spectroscopy to explore this possibility.

Anthony Watts asked: Do the quantum dots (QDs) cause any spectral shift in your engineered photoproteins, as seen with QD coupling to bacteriorhodopsin?

Mike Jones replied: No, we haven't seen any influence of these QDs on the absorbance spectra of the various wild type and mutant RCs and RCLH1 complexes we have attached to them.

Richard Cogdell said: We see the quenching of the QD, but do you see the arrival of the energy at the reaction centre?

Mike Jones replied: Yes. We see enhanced P photobleaching in the presence of QDs and we see enhanced emission from a mutant RC that is engineered to lack the primary electron donor.

Anthony Watts asked: How do you know you've got that asymmetrical arrangement shown in your solar cell figure? Could controlling orientation be worth investigating?

Faraday Discussions

Cite this: DOI: 10.1039/C8FD90007H

DISCUSSIONS View Article Online View Journal

Bionanophotonics: general discussion

Amitava Chandra, Amitabha Chattopadhyay, Richard Cogdell, Ankona Datta, Arijit De, Shaina Dhamija, Murali Golla, Stefan Haacke, Mahesh Hariharan, John Helliwell, Roberto Improta, Ramapurath S. Jayasree, Mike Jones, Joshy Joseph, Tolga Karsili, Bern Kohler, Retheesh Krishnan, Imon Mandal, Dimitra Markovitsi, Himani Medhi, Padmaja P. Mishra, Priyadarshi Roy Chowdhury, Manas Sarangi, Ilme Schlichting, John Seddon, Amit Sharma, Atchimnaidu Siriki, Rajaram Swaminathan, Rienk van Grondelle, Reji Varghese, Ravindra Venkatramani and Anthony Watts

DOI: 10.1039/C8FD90007H

Richard Cogdell opened a general discussion of the paper by Amitabha Chattopadhyay: The analysis depends on the spatial resolution, so when you classify them as dimers or trimers they have to be within a certain volume, so can you say that they are really dimers or are they just very close to each other?

Amitabha Chattopadhyay responded: The analysis depends on spatial correlation of the photobleaching data. The size of the oligomers is deduced from fitting the model.

Amit Sharma asked: What is the size of these clusters when they are dimers or trimers? Would it not be possible to obtain the size through FRET studies?

Amitabha Chattopadhyay answered: The size of the oligomers will be in the nm range. FRET will provide proximity (distance) information, not size.

Rajaram Swaminathan said: I have two questions. First, what role does lipid composition play in the results shown? Will results be different with another lipid composition? Second, are there reports in the literature on GPCR oligomerization in artificial liposomes where composition can be controlled?

Amitabha Chattopadhyay responded: To answer the first question, results from our laboratory and a number of groups have shown that lipid composition could play a role in GPCR function and oligomerization. To the second question, there are not too many examples of GPCRs oligomers studied in reconstituted liposomes. This is due to a variety of reasons which include difficulty in purification, and more importantly, lack of other cellular ingredients (necessary for oligomerization) in liposomal systems.

Faraday Discussions

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DISCUSSIONS View Article Online View Journal

Light induced charge and energy transport in nucleic acids and proteins: general discussion

Amitabha Chattopadhyay, Richard Cogdell, Carlos E. Crespo-Hernández, Ankona Datta, Arijit De, Stefan Haacke, Mahesh Hariharan, John Helliwell, Ashley Hughes, Roberto Improta, Mike Jones, Joshy Joseph, Tolga Karsili, Bern Kohler, Retheesh Krishnan, Anvy Kuriakose, Mahil L, Dimitra Markovitsi, Himani Medhi, Ganga Periyasamy, P. I. Pradeepkumar, Priyadarshi Roy Chowdhury, Manas Sarangi, Igor Schapiro, Gebhard F. X. Schertler, Ilme Schlichting, Javier Segarra-Marti, Rajaram Swaminathan, Vishnu V, Rienk van Grondelle, Ravi Kumar Venkatraman, Ravindra Venkatramani and Anthony Watts

DOI: 10.1039/C8FD90004C

Amitabha Chattopadhyay opened the discussion of the paper by Gebhard F. X. Schertler: Do you have an idea of the timescale of the dynamics of these water molecules in GPCR structures?

Gebhard F. X. Schertler replied: This depends on the water molecules that you are referring to. The water molecules close to the retinal will respond very fast. From looking at the time resolved measurements with bacteriorhodopsin, we know that it is faster than 16 nanoseconds. I expect it to be on the picosecond timescale. Water molecules in the hydrogen bond network connecting to the G protein binding site will rearrange in the same time frame as the conformational changes. In rhodopsin this ranges from microseconds to milliseconds.

Richard Cogdell remarked: I agree that water molecules are important. Why do you think you would use water in this space rather than a larger amino acid? Water gives you a much greater structural flexibility and a faster timescale. Do you think that is a reasonable way to think about it?

Gebhard F. X. Schertler responded: As I pointed out, water molecules can have many roles inside a protein. I focused on the highly occupied water sites. This gives little information about the dynamics and exchange rates of the water molecules. It also does not mean that less ordered water molecules inside the protein are not important and so they could exist if the space allows it. I think you are implying

Faradav Discussions

Cite this: DOI: 10.1039/C7FD90093G

DISCUSSIONS View Article Online View Journal

Electrochemistry: general discussion

Andrew Abbott, Leigh Aldous, Natalia Borisenko, Samuel Coles, Olivier Fontaine, Jorge Daniel Gamarra Garcia, Ramesh Gardas, Oliver Hammond, Laurence J. Hardwick, Paul-Henri Haumesser, Florian Hausen, Corie Horwood, Johan Jacquemin, Robert Jones, Erlendur Jónsson, Abhishek Lahiri, Doug MacFarlane, Guy Marlair, Benjamin May, Himani Medhi, Vitor H. Paschoal, Joshua E. S. J. Reid, Theresa Schoetz, Kazuhisa Tamura, Morgan L. Thomas, Shraeddha Tiwari, Betul Uralcan, Adriaan van den Bruinhorst, Masayoshi Watanabe and James Wishart

DOI: 10.1039/C7FD90093G

Andrew Abbott opened a general discussion of the paper by Abhishek Lahiri: The word "anomalous" at the start of the presentation is only valid when it is put into perspective. The results are possibly unexpected compared to pure water but they are not anomalous once speciation is taken into account. Since the redox potential is governed by speciation, if you get the speciation the same then the galvanic series should also be the same. Our work has shown the relative redox potentials for metal couples in deep eutectic solvents (DESs).[1] Repeating the experiments in aqueous NaCl solutions produces the same galvanic series and good correlation in redox potentials.[2] I would certainly welcome the publication of more standard redox potentials in ionic liquids.

1 A. P. Abbott, G. Frisch, S. J. Gurman, A. R. Hillman, J. Hartley, F. Holyoak and K. S. Ryder, *Chem. Commun.*, 2011, **47**, 10031–10033.
2 J. Hartley, PhD thesis, University of Leicester, 2011.

Abhishek Lahiri replied: We agree with the comment that speciation governs the redox potentials of the species/metal ions. In our case we have used the word "anomalous" by considering the standard aqueous electrochemical series. In order to obtain a standard redox potential in ionic liquid, first one needs to have a standard reference electrode which can be used for all ionic liquids and won't be affected by varying the constituent ions. Also understanding the speciation in chloride/non-chloride-based ILs is not straightforward. Therefore, developing a universal galvanic series in ILs still remains a challenge.

Leigh Aldous asked: You talked about the conventional galvanic series, but this refers to pure metals, while you are actually forming complexes or alloys. Is this a genuine ionic liquid effect or would you see the same effect in aqueous media or organic solvents?

Faraday Discussions

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DISCUSSIONS View Article Online View Journal

Phase behaviour and thermodynamics: general discussion

Andrew Abbott, Hiroshi Abe, Leigh Aldous, Rob Atkin, Magdalena Bendová, Matteo Busato, José Nuno Canongia Lopes, Margarida Costa Gomes, Benjamin Cross, Carin Dietz, Jeffrey Everts, Millicent Firestone, Ramesh Gardas, Matthieu Gras, Tamar Greaves, Simon Halstead, Christopher Hardacre, Jason Harper, John Holbrey, Johan Jacquemin, Philip Jessop, Doug MacFarlane, Florian Maier, Himani Medhi, Markus Mezger, Agilio Pádua, Susan Perkin, Joshua E. S. J. Reid, Satyen Saha, John M. Slattery, Morgan L. Thomas, Shraeddha Tiwari, Seiji Tsuzuki, Betul Uralcan, Masayoshi Watanabe, James Wishart and Tristan Youngs

DOI: 10.1039/c7fd90091k

Agilio Pádua opened the discussion of the introductory lecture by Doug MacFarlane: Why are phosphonium/phosphate ionic liquids such good lubricants? I understand they tend to form ion pairs in the bulk liquids because both cation and anion contain a charged center surrounded by long alkyl chains, resulting in an "oily" character. Is it known if these aggregates remain in the interfacial layers with the metal, or if the ions pairs dissociate and it is single ions that attach to the surface?

Doug MacFarlane replied: In low dielectric constant media such as base lubricant oils, the degree of dissociation is unlikely to be very high. At the surface there may be specific adsorption of one of the ions in particular, depending on the charge or functionality of the surface, however the counterion is likely to remain in close association in the secondary layer.

Andrew Abbott asked: Concerning the diagram correlating conductivity *vs.* composition we have previously suggested that the difference between an ionic liquid and an ionic solution is that the charge changes from being dominated by hole mobility to ion mobility.[1] Does your description support this idea or move it to a point where ions cluster. On another point: Your assumption ignores the issues of heterogeneity. Work in the literature suggests pools of water in ILs and *vice versa*, how does this fit into the model?

1 A. P. Abbott, K. S. Ryder, P. Licence and A. W. Taylor, *What is an Ionic Liquid? In Ionic Liquids Completely UnCOILed*, ed. Plechkova and Seddon, John Wiley and Sons, Hoboken, NJ, USA, 2015.

Faraday Discussions
Cite this: *Faraday Discuss.*, 2017, **199**, 195

Electrotunable wetting, and micro- and nanofluidics: general discussion

Martin Bazant, Roland Bennewitz, Lydéric Bocquet, Nikolay Brilliantov, Ranabir Dey, Carlos Drummond, Robert Dryfe, Hubert Girault, Kelsey Hatzell, Konstantin Komev, Alexei A. Komyshev, Irena Kratochvilova, Anthony Kucernak, Mohit Kulkarni, Sunny Kumar, Alpha Lee, Serge Lemay, Himani Medhi, Andrew Mount, Frieder Mugele, Susan Perkin, Mark Rutland, George Schatz, David Schiffrin, Elisabeth Smela, Evgeny Smirnov, Michael Urbakh and Andriy Yaroshchuk

DOI: 10.1039/C7FD90028G

David Schiffrin opened discussion of the introductory lecture by Serge Lemay: After listening carefully to your challenging presentation I was left wondering if you believe in the validity of modeling as a reasonable approach to solving scientific issues?

Serge Lemay responded: It appears that I may have taken an overly pessimistic tone during the presentation! Yes, I believe that modeling is an important tool for disentangling complex transport processes involving diffusion, convection and electron transfer. In our work on electrochemical nanofluidics, for example, we have strived to account quantitatively for experimental observations using a combination of analytical calculations, simplified one-dimensional transport models and three-dimensional finite-element calculations. In practice, however, new effects are usually first encountered in the form of unexpected results to an experiment. For the case of concentration polarization, for example, we only came to the realization that it is necessary to account for the differences in diffusion coefficients between redox states after observing cross-talk between different electrodes co-located in a nanofluidic channel. While this could have been first predicted *via* modeling, there was little motivation to attempt such modeling until an experiment exhibited behaviour that was not fully understood.

Andriy Yaroshchuk opened a general discussion of the paper by Frieder Mugele: In the paper, you mention a surface charge density of -32 mC m^{-2} estimated from a zeta potential of approximately -40 mV at the salt concentration of 10^{-6} mol L^{-1}. According to my estimate, the charge density, should actually be about two orders of magnitude lower. To what extent could this change your conclusions?

Faraday Discussions

Cite this: DOI: 10.1039/C7FD90092A

DISCUSSIONS View Article Online View Journal

Structure and dynamics of ionic liquids: general discussion

Matthew Addicoat, Rob Atkin, José Nuno Canongia Lopes, Margarida Costa Gomes, Millicent Firestone, Ramesh Gardas, Simon Halstead, Christopher Hardacre, Laurence J. Hardwick, John Holbrey, Patricia Hunt, Vladislav Ivaništšev, Johan Jacquemin, Robert Jones, Barbara Kirchner, Ruth Lynden-Bell, Doug MacFarlane, Guy Marlair, Himani Medhi, Markus Mezger, Agílio Pádua, Isabel Pantenburg, Susan Perkin, Joshua E. S. J. Reid, Mark Rutland, Satyen Saha, Karina Shimizu, John M. Slattery, Malgorzata Swadźba-Kwaśny, Shraeddha Tiwari, Seiji Tsuzuki, Betul Uralcan, Adriaan van den Bruinhorst, Masayoshi Watanabe and James Wishart

DOI: 10.1039/C7FD90092A

Mark Rutland opened the discussion of the paper by Markus Mezger: In these elegant experiments you fit your reflectometry data to an oscillatory function with a characteristic wavelength, related to the ion profiles away from the surface. Upon applying electrical potentials, changes in the composition of the layer closest to the surface are observed, but subsequent layers remain largely unchanged. The surface roughness is comparable to the spacing which reduces the resolution. Is an oscillatory profile model justified under these circumstances, or could the data be equally well fitted with a single layer model?

Markus Mezger responded: The observed reflectivity curves, in particular for −2.5 V, the blue squares in Fig. 5b of our paper (DOI: 10.1039/c7fd00171a), cannot be adequately described using a single layer model. Indeed, the periodicity of the oscillatory profile of 7.3 Å is more than twice the surface roughness of 2.6 Å. Similar oscillatory profiles have been found for a wide variety of IL/solid interfaces by us[1] and by other groups.[2,3] In fact, the only case where we can fit the experimental XRR data using a single layer model is the $[bmim]^+[BF_4]^-$/sapphire interface.[4] However, unlike most other ILs, $[bmim]^+[BF_4]^-$ also exhibits no clear scattering peak from the charge correlations in bulk.

1 M. Mezger, H. Schröder, H. Reichert, S. Schramm, J. S. Okasinski, S. Schöder, V. Honkimäki, M. Deutsch, B. M. Ocko, J. Ralston, M. Rohwerder, M. Stratmann and H. Dosch, *Science*, 2008, 322, 424–428.
2 Z. Brkljača, M. Klimczak, Z. Miličević, M. Weisser, N. Taccardi, P. Wasserscheid, D. M. Smith, A. Magerl and A.-S. Smith, *J. Phys. Chem. Lett.*, 2015, 6, 549–555.

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DOI: 10.1039/C7FD90028G

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Andriy Yaroshchuk opened a general discussion of the paper by Frieder Mugele: In the paper, you mention a surface charge density of -32 mC m^2 estimated from a zeta potential of approximately -40 mV at the salt concentration of 10^{-6} mol L^{-1}. According to my estimate, the charge density, should actually be about two orders of magnitude lower. To what extent could this change your conclusions?

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DISCUSSIONS View Article Online
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Nanocomposites: general discussion

Guruswamy Kumaraswamy, Sanat Kumar, Siddharth Kulkarni, Ajeet Srivastav, Priyadarshi Roy Chowdhury, G. V. Pavan Kumar, Erika Eiser, Alison Edwards, B. L. V. Prasad, Madivala G. Basavaraj, Nagaraj Shetti, Michael Bockstaller, Himani Medhi, Yogesh M. Joshi, Neena S. John, Charusita Chakravarty, Vandana Shinde, Rajdip Bandyopadhyaya, Nicholas Kotov, Ramanan Krishnamoorti, Marc Couty, Jacques Jestin and Daan Frenkel

DOI: 10.1039/C6FD90003H

Yogesh M. Joshi opened a discussion of the paper by Marc Couty: It is indeed a very novel way of manufacturing the composite: first dissolving and swelling Styrene butadiene copolymer in styrene and subsequently crosslinking the latter. Does such assembly have any special benefits in terms of mechanical or other properties over the usual Styrene butadiene copolymer?

While it has been claimed that post swelling occurs, it is possible to separate the filler into the small aggregates. The SEMs in Figure 3 in your manuscript do not show any appreciable change in aggregate size. As expected, it seems only the average inter-particle distance has increased.

Marc Couty responded: After polymerisation, the polystyrene content is so high that the sample is glassy at room temperature and of no use for tyre properties. The experiment should be repeated at a lower swelling ratio to test the mechanical properties of such a material.

Indeed, SEM does not show any reduction in size of the object. We must keep in mind that since SEM is revealing only 10 nm under the surface of the material, for such branched objects made of primary particles around 10 nm it gives only informations on cuts of the "branches". If one assimilates the aggregate with a human hand, SEM would be equivalent to image finger cuts.

B. L. V. Prasad enquired: 1. During the preparation process some reagents are added to the filler silica particles and it is seen that these reagents then adhere to the silica particles. What happens if these silica particles are pre-grafted with these reagents?

2. Is the chemical nature of the interactions between the grafted silica particles and then polymer well understood? How important is this for the final quality and function of the material?

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DISCUSSIONS View Article Online View Journal | View Issue

Dynamics of chemical bond: general discussion

Kunal Dhoke, Martin Zanni, Upendra Harbola, Ravi Kumar Venkatraman, Elangannan Arunan, King-Chuen Lin, Artur Nenov, Jonathan Skelton, R J Dwayne Miller, Jonathan D. Hirst, Vincenzo Aquilanti, John R. Helliwell, Srihari Keshavamurthy, Sai Ramesh, Mike Ashfold, Anuradha Pallipurath, Priyadarshi Roy Chowdhury, Sanghamitra Mukhopadhyay, Jemmis E D, Himani Medhi, Debabrata Goswami, Prasenjit Halder, Wolfgang Junge, Mahesh Hariharan, Santosh Kumar Singh, Siva Umapathy, Adithya Lakshmannam, Martin Meedom Nielsen, Sankarampadi Aravamudhan, Volker Deckert, Kenneth Ghiggino, Keisuke Tominaga and Alison Edwards

DOI: 10.1039/C5FD90016F

Wolfgang Junge began the discussion by asking **Volker Deckert**: If your AFM-tip is optimally placed on a given target, what would be the highest time resolution for a Raman-transient under a single turnover?

Volker Deckert answered: We have not done such experiments with our tips yet, however, the results from the van Duyne group report Raman spectra with pulse durations of 1 ps.[1,2]

1 E. A. Pozzi *et al.*, Ultrahigh Vacuum Tip-Enhanced Raman Spectroscopy with Picosecond Excitation, *The Journal of Physical Chemistry Letters*, 2014, 5, 2657–2661.
2 J. M. Klingsporn, M. D. Sonntag, T. Seideman and R. P. van Duyne, Tip-Enhanced Raman Spectroscopy with Picosecond Pulses, *The Journal of Physical Chemistry Letters*, 2014, 5, 106–110.

Siva Umapathy followed with the question: When you compare the SERS vs. the TERS spectrum do you expect the spectral intensities of various Raman peaks to remain the same, considering the molecular conformation of the adsorbed molecule may be different?

Volker Deckert responded: The way we compare SERS and TERS spectra, we do not consider and compare the intensities for exactly this reason. However, the SERS spectra, in particular the ones measured on the silver island films, show only minute intensity variations. So, macroscopically different enhancement sites, hot-spots and various conformation changes are being averaged in the

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DISCUSSIONS View Article Online View Journal | View Issue

Time and Space resolved Methods: general discussion

Martin Zanni, Jemmis E D, Sankarampadi Aravamudhan, Anuradha Pallipurath, Elangannan Arunan, Christoph Schnedermann, Ashok Kumar Mishra, Mark Warren, Jonathan D. Hirst, Franklin John, R. Pal, John R. Helliwell, Kiran Moirangthem, Shamik Chakraborty, Arend G. Dijkstra, Priyadarshi Roy Chowdhury, Kenneth Ghiggino, R J Dwayne Miller, Stephen Meech, Himani Medhi, Mahesh Hariharan, Freek Ariese, Alison Edwards, Ajith R. Mallia, Siva Umapathy, Martin Meedom Nielsen, Neil Hunt, Zhen-Yu Tian, Jonathan Skelton, Gopinathan Sankar and Debabrata Goswami

DOI: 10.1039/c5fd90017d

John R. Helliwell opened a general discussion of the paper by **Franklin John**: I think your paper didn't prove encapsulation, can you please summarise your poster results? *I.e.* as they truly prove the encapsulation of the drug.

Franklin John responded: The *in vitro* release profile indicated that nearly 80% of SCR7 was released within 4 days. In 24 h, which is the time scale of the cytotoxic studies, *in vitro* release showed 50% drug release.

The best fit values of the Dynamic Light Scattering (DLS) data indicate the formation of micelles with a hydrodynamic diameter of 22.8 nm with a poly-dispersity index (PDI) of 0.188. Further evidence for drug encapsulated micelles was obtained from Small Angle Neutron Scattering (SANS) measurements.

Analysis of the SANS data indicated the formation of micelles with a core radius of 35 Å and a shell thickness of 46 Å.

John R. Helliwell asked: What is the anticipated timescale of the release of the anticancer agent from its capsule?

Franklin John responded: Nearly 80% release occurred *in vitro* within 4 days. In 24 h, about 50% release was observed.

Siva Umapathy enquired: How do we know that the encapsulated drug goes in and out of the cell membrane and then further into the nuclear membrane. What is the mechanism that induces the drugs to enter the cell?

19

Functionalized Nanomaterials for Pollution Abatement

Himani Medhi and Krishna G. Bhattacharyya

Gauhati University, Department of Chemistry, Guwahati, Assam 781014, India

19.1 Introduction

Recent advances in nanoscience and technology offer leapfrogging achievements and opportunities to develop next-generation technologies for better environment and better society. The current practices of treating contaminated water rely heavily on huge centralized systems and are considered mostly unsustainable. It has been foreseen that newer forms of nanomaterials are destined to play a very important role in water treatment. The novel size-dependent properties of nanomaterials in clear distinction from their large counterparts make them important candidates for applications in water and wastewater treatment. Properties such as high specific surface area, fast dissolution rate, high reactivity, and strong sorption, important in water treatment and in a spectrum of other applications, can be improved by functionalization of the nanomaterials through introduction of selective materials. Their discontinuous properties such as superparamagnetism, localized surface plasmon resonance, quantum confinement effect, and so on can also be taken advantage of in modeling suitable materials.

The modular and multifunctional processes enabled in the functionalized nanomaterials are likely to make them ideal and highly efficient for water treatment that does not rely on large infrastructure [1–3]. Nanotechnology-enabled air, water and wastewater treatment processes promise to overcome major challenges faced by the existing treatment technologies and augment new capabilities for an enlarged scope of economic utilization of unconventional water sources (Figure 19.1).

In the recent years, new carbonaceous nanomaterials have been reported such as graphene nanosheets (GNs), single-wall (SW) and multiwall (MW) carbon nanotubes (CNTs), and their functionalized varieties with high surface area, and an array of functional groups for use as adsorbents. With newer materials being synthesized and chemically modified, nanomaterials and their functionalized forms have attracted tremendous interest and their applications have increased dramatically in the past few years. Some aspects of environmental applications of the functionalized nanomaterials are listed in Table 19.1.

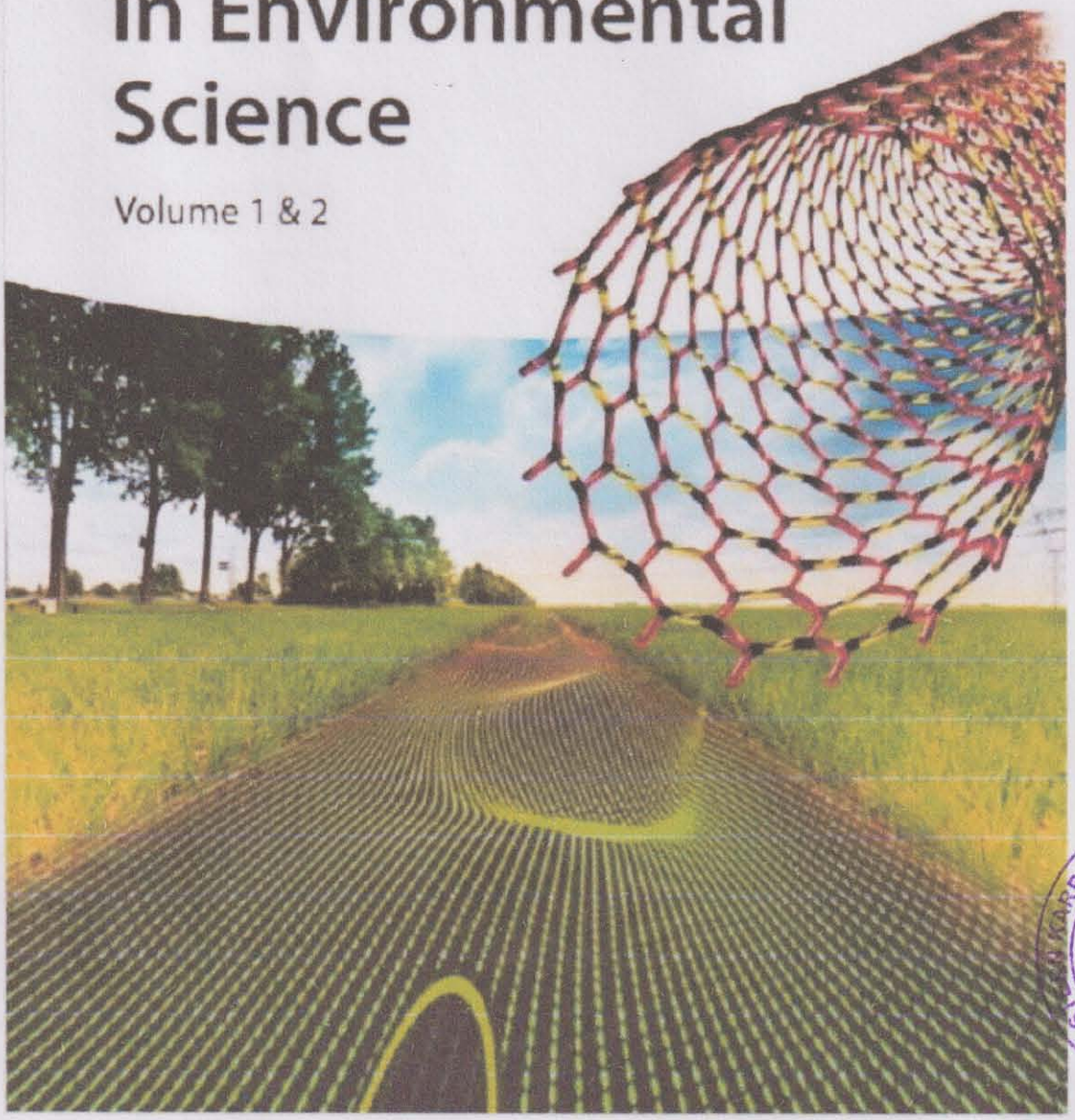
Nanotechnology in Environmental Science. First Edition. Edited by Chaudhery Mustansar Hussain and Ajay Kumar Mishra.

WILEY-VCH

Edited by
Chaudhery Mustansar Hussain and Ajay Kumar Mishra

Nanotechnology in Environmental Science

Volume 1 & 2



19

Functionalized Nanomaterials for Pollution Abatement

Himani Medhi and Krishna G. Bhattacharyya

Gauhati University, Department of Chemistry, Guwahati, Assam 781014, India

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Faraday Discussions

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Synthesis of Nanoparticle Assemblies: general discussion

Madhura Som, Sristi Majumdar, Nirmalya Bachhar, Guruswamy Kumaraswamy, G. V. Pavan Kumar, Vinothan N. Manoharan, Sanat Kumar, Madivala G. Basavaraj, Siddharth Kulkarni, Ranjini Bandyopadhyay, Sudeep Punnathanam, Himani Medhi, Ajeet Srivastav, Daan Frenkel, Mukta Tripathy, Erika Eiser, Lola Gonzalez-Garcia, Priyadarshi Roy Chowdhury, Jayant Singh, Vimala Sridurai, Alison Edwards, B. L. V. Prasad, Amit Kumar Singh, Michael Bockstaller, Neena S. John, Jyoti Seth, Mayank Misra, Charusita Chakravarty, Vandana Shinde, Rajdip Bandyopadhyaya, Jacques Jestin, Radhika Poojari, Nicholas Kotov, Oleg Gang, Alamgir Karim, Yon Ju-Nam, Steve Granick, Semen Chervinskii and Andrea Tao

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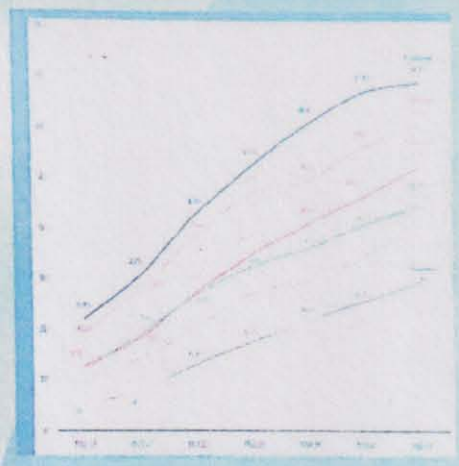
Nicholas Kotov opened a discussion of the introductory lecture by Steve Granick: I much appreciated the historical perspective of the particle self-assembly studies. It is important to know where the current research came from. The connection between the nanoscale matter and biological matter is also significant and represents the growth point of the field. From your studies it is clear that the colloidal systems become particularly interesting when particles acquire anisotropy which is dipolar anisotropy in your works. What are the other degrees of isotropies that you can engineer into these particles and what self-assembly effects would you expect from them?

Steve Granick responded: Your important question encapsulates some of the most urgent and pressing questions of this research field. Anisotropy can generate important and interesting shapes, which we as a community know well, starting from the proud tradition of studying surfactant self-assembly. Increasingly recognized is that anisotropy can also generate important and interesting shapes out of equilibrium, as we know in nature from the flocking of birds and the generation of schools of fish, and perhaps also in the social interactions of people. Many people around the world are exploring the implications.

Vinothan N. Manoharan remarked: In response to Prof. Kotov's question about designing other types of anisotropy in nanoparticles: one point to take away from Prof. Granick's lecture is that we should focus not only on spatial anisotropy, but

Economics of Education



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A Case Study on Economy of Chemical Education

H. Medhi[1, 2*], A. Das[1], Dr. P. D. Baruah[1]
Dr. M. Baruah[1] and P. Goswami[1]
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Guwahati College, Guwahati-781021
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Guahati University, Guwahati-781014

Key words : *Chemistry, chemicals, apparatus, pollution and economical chemical* education.

Introduction :

Higher education is considered as a facilitator for growth of society. UNESCO reported in the 21st century that "higher education is the mandate to bridge the knowledge gap between countries and communities enriching dialogues between people, culture, international living and networking of ideas, research and technologies." The higher educational institutions are those where post 10+2 education is provided. Higher Education in India has acquired special significance since independence (N. Konwar and S. Chakraborty, 2013).

Chemistry is a branch of physical science that studies the composition, structure, properties and change of matter. Chemistry deals with such topics as the properties of individual atoms, how atoms form chemical bonds to create chemical compounds, the interactions of substances through intermolecular forces that give matter its general properties, and the interactions between substances through chemical reactions to form different substances. Again, it is realised or not it is a fact that, as a living being, we are all chemists. Every time we light a match, boil an egg or simply breathe in and out, we perform so many chemical processes and reactions within our body. Hence, chemistry is a very fundamental science that impacts all of us and our environment. Chemistry is often referred to as the central science because it joins together physics and mathematics, biology and medicine, and the earth and environmental science. Hence, chemical education is a necessary part for higher education in sciences. Some examples of pure chemical substances are shown below that are used in our day to day life.

Figure 1. From left to right: Sucrose (pure sugar; $C_{12}H_{22}O_{11}$), Sodium chloride (salt; NaCl), Citric acid (lemon juice; $C_6H_8O_7$), Sodium bicarbonate (baking soda, $NaHCO_3$), hydrogen

IMPACT OF NOISE POLLUTION ON ENVIRONMENT WITH SPECIAL REFERENCE TO TRAFIC NOISE

Editor
Debabrata Debnath

Proceedings: UGC sponsored State level Conference on "Impact Of Noise Pollution On Environment With Special Reference To Traffic Noise"
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NOISE POLLUTION AND ITS IMPACT- A REVIEW

Himani Medhi*
Dr. Pulakananda Dutta Baruah**

Abstract :

Noise is the sound that causes discomfort to us. It is a creation of modern life. The noise may be low or high. It is measured in 'Bel' (B) unit. 60 decibel (dB) is the sound intensity in our normal conversation and above this limit we feel discomfort. In general sound at 120 decibel and above it we feel pain. The noise produces various adverse effects to human. The effects of noise on human are well known and now day's researchers attract their attention towards effects of noise on wildlife of our environment to attain a sustainable ecosystem. Various animals, insects and birds communicate among themselves through sound, not audible to us. The animals and birds move away from the intermittent noisy places (like traffic point, industrial area, loud music playing stations etc.) for their comfort and communication.In check of noise pollution, various laws have been enacted but a little effort has been given during its implementation. Noise pollution is not diminished, but with the development and urbanization of the society, it is increasing day by day. Without proper control of noise, the mankind and the whole ecosystem will have to suffer a lot.

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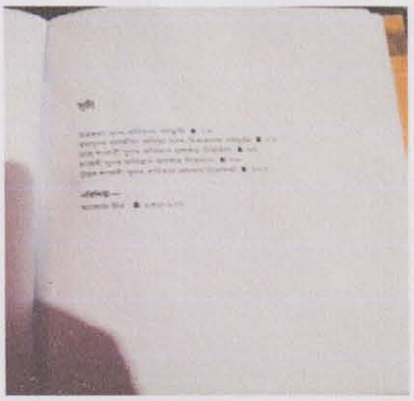

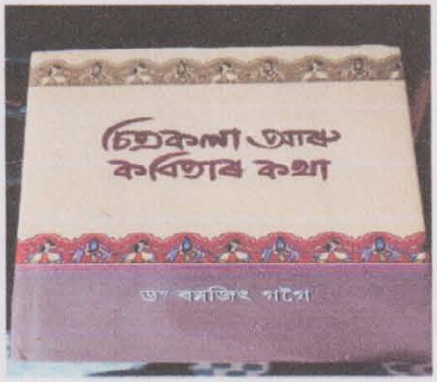

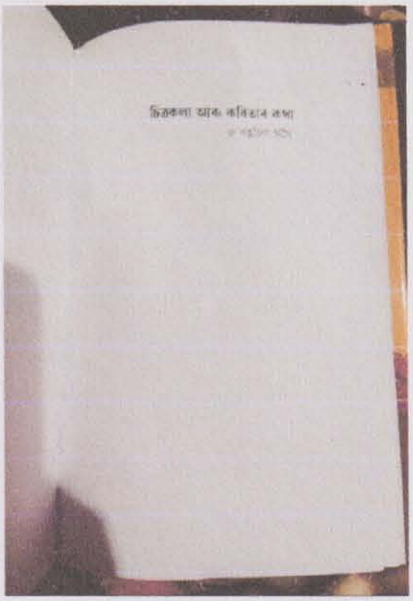

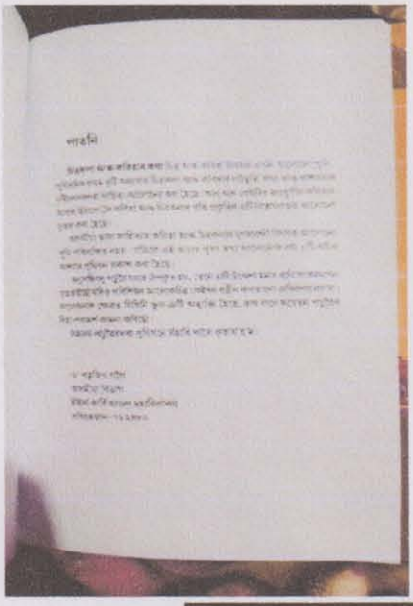

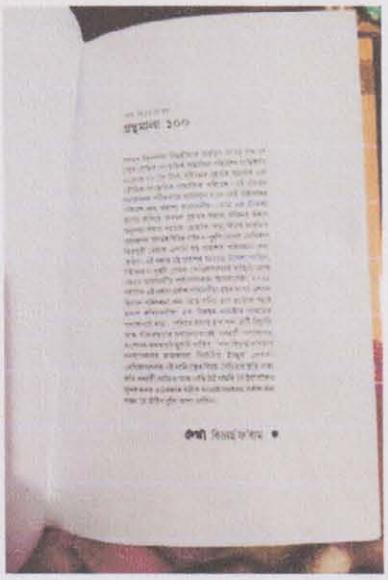

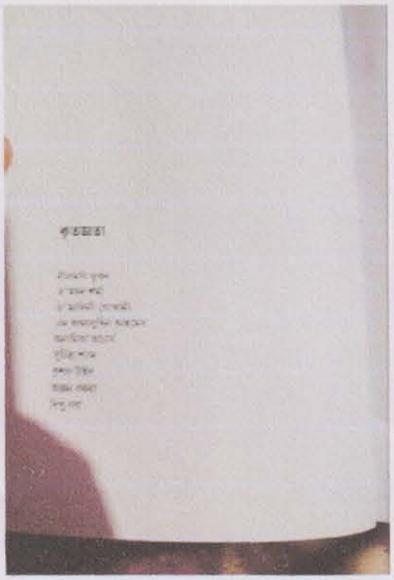

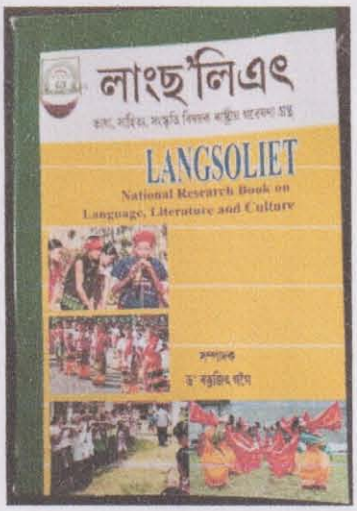
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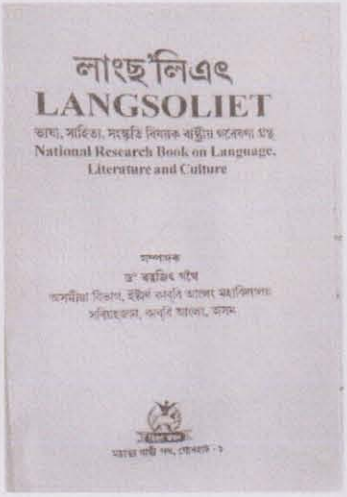
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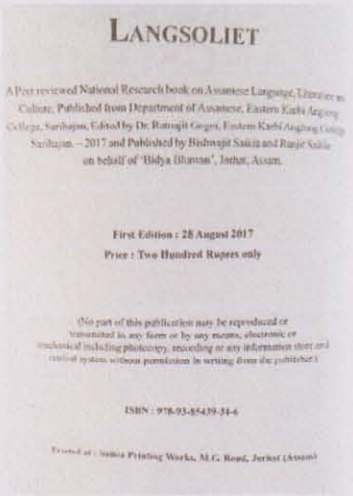
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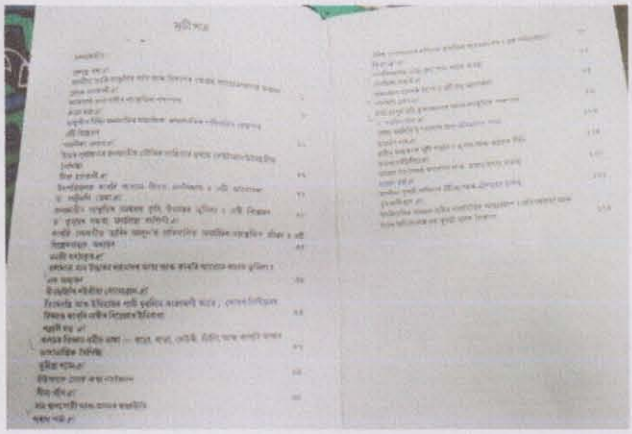


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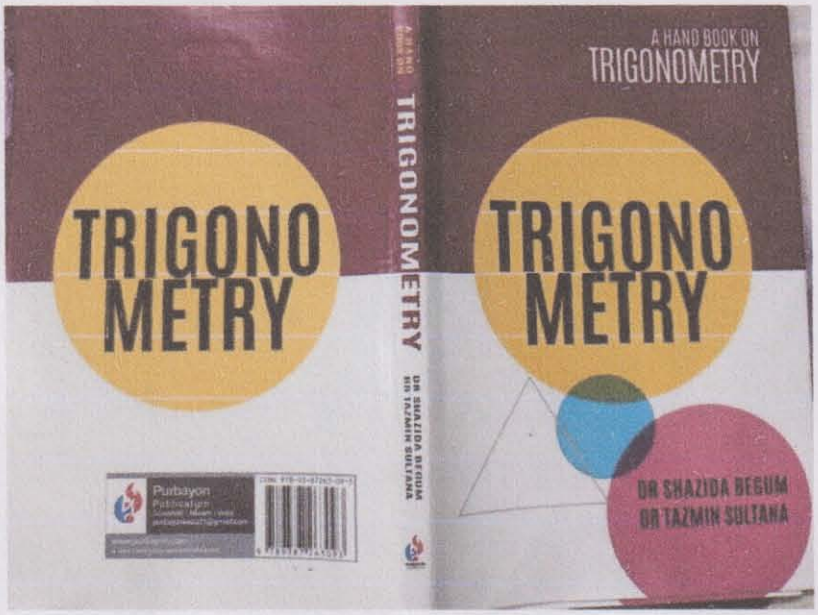

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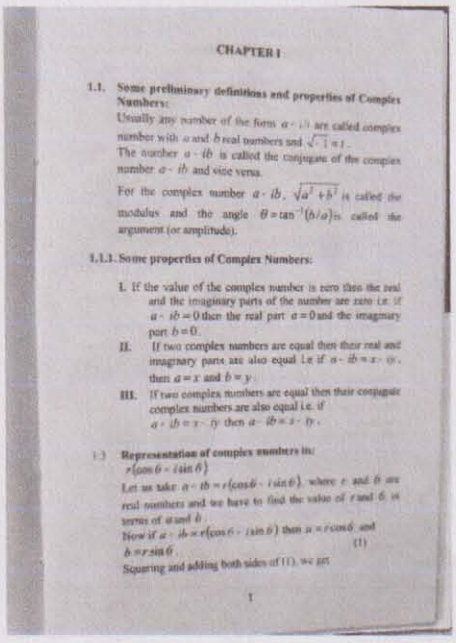


CHAPTER I

1.1. Some preliminary definitions and properties of Complex Numbers:

Usually any number of the form $a + ib$ are called complex number with a and b real numbers and $\sqrt{-1} = i$.

The number $a - ib$ is called the conjugate of the complex number $a + ib$ and vice versa.

For the complex number $a + ib$, $\sqrt{a^2+b^2}$ is called the modulus and the angle $\theta = \tan^{-1}(b/a)$ is called the argument (or amplitude).

1.1.1. Some properties of Complex Numbers:

I. If the value of the complex number is zero then the real and the imaginary parts of the number are zero i.e. if $a + ib = 0$ then the real part $a = 0$ and the imaginary part $b = 0$.

II. If two complex numbers are equal then their real and imaginary parts are also equal i.e if $a + ib = x + iy$, then $a = x$ and $b = y$.

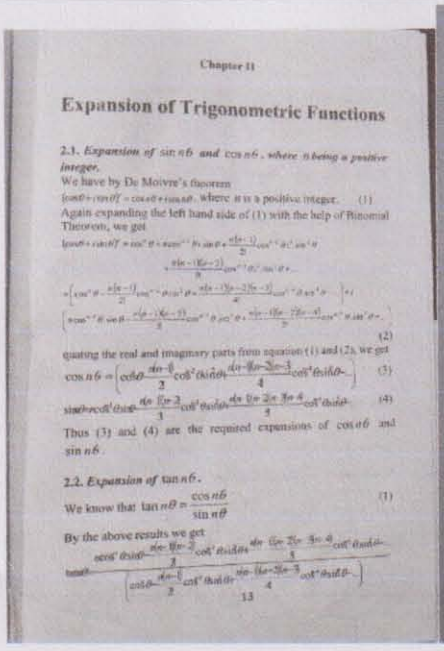
III. If two complex numbers are equal then their conjugate complex numbers are also equal i.e. if $a + ib = x + iy$ then $a - ib = x - iy$.

1.2. Representation of complex numbers in: $r(\cos\theta + i\sin\theta)$

Let us take $a + ib = r(\cos\theta + i\sin\theta)$, where r and θ are real numbers and we have to find the value of r and θ in terms of a and b.

Now if $a + ib = r(\cos\theta + i\sin\theta)$ then $a = r\cos\theta$ and $b = r\sin\theta$. (1)

Squaring and adding both sides of (1), we get



Chapter II

Expansion of Trigonometric Functions

2.1. *Expansion of* $\sin n\theta$ *and* $\cos n\theta$, *where* n *being a positive integer.*

We have by De Moivre's theorem

$(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$, where n is a positive integer. (1)

Again expanding the left hand side of (1) with the help of Binomial Theorem, we get

$$(\cos\theta + i\sin\theta)^n = \cos^n\theta + n\cos^{n-1}\theta\, i\sin\theta + \frac{n(n-1)}{2}\cos^{n-2}\theta\, i^2\sin^2\theta + \frac{n(n-1)(n-2)}{3}\cos^{n-3}\theta\, i^3\sin^3\theta + \ldots$$

$$= \left(\cos^n\theta - \frac{n(n-1)}{2}\cos^{n-2}\theta\sin^2\theta + \frac{n(n-1)(n-2)(n-3)}{4}\cos^{n-4}\theta\sin^4\theta - \ldots\right) + i\left(n\cos^{n-1}\theta\sin\theta - \frac{n(n-1)(n-2)}{3}\cos^{n-3}\theta\sin^3\theta + \frac{n(n-1)(n-2)(n-3)(n-4)}{5}\cos^{n-5}\theta\sin^5\theta - \ldots\right) \quad (2)$$

equating the real and imaginary parts from equation (1) and (2), we get

$$\cos n\theta = \left(\cos\theta - \frac{n(n-1)}{2}\cos^2\theta\sin^2\theta + \frac{n(n-1)(n-2)(n-3)}{4}\cos^4\theta\sin^4\theta - \ldots\right) \quad (3)$$

$$\sin n\theta = \left(n\cos^{n-1}\theta\sin\theta - \frac{n(n-1)(n-2)}{3}\cos^{n-3}\theta\sin^3\theta + \frac{n(n-1)(n-2)(n-3)(n-4)}{5}\cos^{n-5}\theta\sin^5\theta - \ldots\right) \quad (4)$$

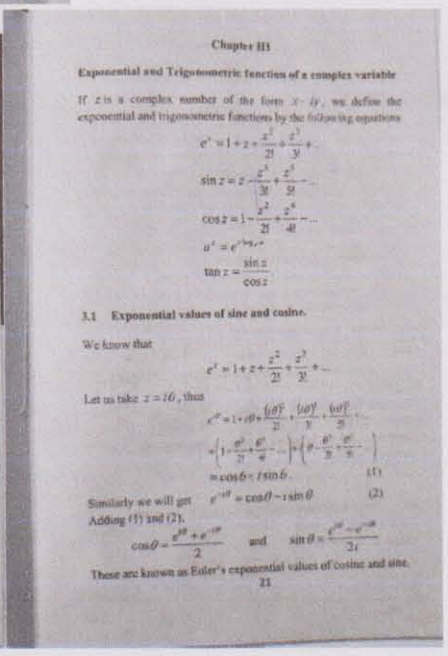
Thus (3) and (4) are the required expansions of $\cos n\theta$ and $\sin n\theta$.

2.2. *Expansion of* $\tan n\theta$.

We know that $\tan n\theta = \dfrac{\sin n\theta}{\cos n\theta}$ (1)

By the above results we get

$$\tan n\theta = \frac{n\cos^{n-1}\theta\sin\theta - \frac{n(n-1)(n-2)}{3}\cos^{n-3}\theta\sin^3\theta + \frac{n(n-1)(n-2)(n-3)(n-4)}{5}\cos^{n-5}\theta\sin^5\theta - \ldots}{\left(\cos^n\theta - \frac{n(n-1)}{2}\cos^{n-2}\theta\sin^2\theta + \frac{n(n-1)(n-2)(n-3)}{4}\cos^{n-4}\theta\sin^4\theta - \ldots\right)}$$



Chapter III

Exponential and Trigonometric function of a complex variable

If z is a complex number of the form $x + iy$, we define the exponential and trigonometric functions by the following equations

$$e^z = 1 + z + \frac{z^2}{2!} + \frac{z^3}{3!} + \ldots$$

$$\sin z = z - \frac{z^3}{3!} + \frac{z^5}{5!} - \ldots$$

$$\cos z = 1 - \frac{z^2}{2!} + \frac{z^4}{4!} - \ldots$$

$$a^z = e^{z\log_e a}$$

$$\tan z = \frac{\sin z}{\cos z}$$

3.1 Exponential values of sine and cosine.

We know that

$$e^z = 1 + z + \frac{z^2}{2!} + \frac{z^3}{3!} + \ldots$$

Let us take $z = i\theta$, thus

$$e^{i\theta} = 1 + i\theta + \frac{(i\theta)^2}{2!} + \frac{(i\theta)^3}{3!} + \frac{(i\theta)^4}{4!} + \ldots$$

$$= \left(1 - \frac{\theta^2}{2!} + \frac{\theta^4}{4!} - \ldots\right) + i\left(\theta - \frac{\theta^3}{3!} + \frac{\theta^5}{5!} - \ldots\right)$$

$$= \cos\theta + i\sin\theta. \quad (1)$$

Similarly we will get $e^{-i\theta} = \cos\theta - i\sin\theta$ (2)

Adding (1) and (2),

$$\cos\theta = \frac{e^{i\theta} + e^{-i\theta}}{2} \quad \text{and} \quad \sin\theta = \frac{e^{i\theta} - e^{-i\theta}}{2i}$$

These are known as Euler's exponential values of cosine and sine.

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Contents

Chapter - 5

Rutin: A Type of Flavonoid with Immense Health Benefits

Rajesh Prasad and Surya Bali Prasad

Abstract

Flavonoids are the group of polyphenolic compounds found commonly in plants and make an important component of the human diet. Flavonoids have relatively low toxicity compared to other active plant compounds. Rutin is a type of flavonoid found in many plants and its name comes from the plant *Ruta graveolens*, which contains rutin as its one of the main chemical constituents. Rutin has been shown to have a wide range of biological and pharmacological activities such as antioxidant, anticancer, anti-inflammatory, anti-diabetic, etc. Many ongoing research on the potential health benefits of rutin has revealed that this flavonoid indeed has advantageous and huge therapeutic potential. The details on the sources, chemistry, biosynthesis, biological and pharmacological properties of rutin have been highlighted here in a comprehensive way so that the importance of rutin on health benefits is widely recognized and the food items rich in rutin should be incorporated as a supplement.

Keywords: flavonoid, rutin, pharmacological properties, health benefits

Introduction

The basic food for all organisms is produced by green plants and plant products are essential for human nutrition and health. Plants produce fruits rich in carbohydrates, vitamins, and fiber that are necessary for health maintenance. Different parts of plants serve different purposes in our diet and have been used as a great source of medicine for a variety of diseases. The use of plants as medicine is safer due to their lower chances of side effects and also better compatibility with humans. Some of the medicines derived from plants include vincristine, digitalis, colchicine, reserpine, quinine, morphine, taxol, and aspirin, etc.

Nutritional supplements have been widely used by the general public worldwide as they are the source of different bioactive substances. The bioactive substances derived from plants are generally called phytochemicals.

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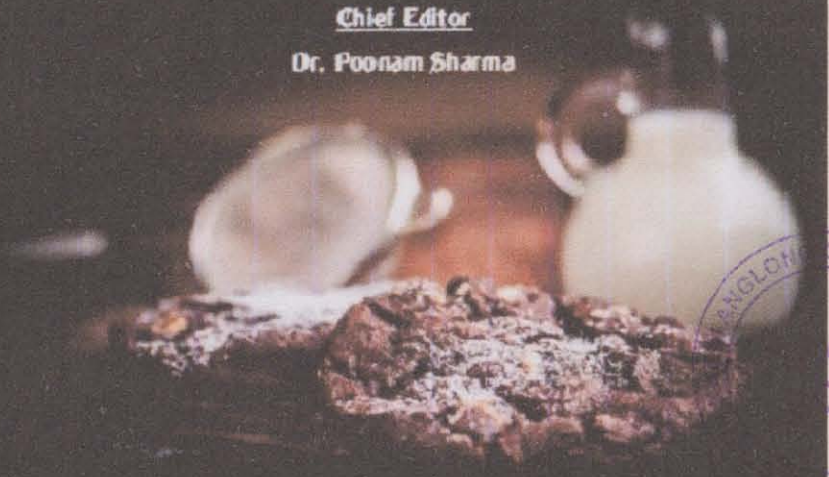

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Contents

Chapter - 6

Rutin: A Promising Phytochemical and Nutraceutical

Rajesh Prasad

Abstract

Phytochemicals are biologically active compounds present in plants that are not 'essential' for life but promote human health. Fruits, vegetables, grains, legumes, nuts, and teas are rich sources of phytochemicals. Nutraceuticals are products derived from food sources that are purported to provide extra health benefits, in addition to the basic nutritional value found in foods. Nowadays, the use of phytochemicals as nutraceutical and functional foods is rapidly growing with regard to human health. The aim of this chapter is to elaborate the role of rutin which is a flavonol-type flavonoid, composed of quercetin and rutinose as a vital phytochemical and nutraceutical. Rutin is widely distributed in nature in various vegetables and fruits such as the passion flower, buckwheat, green asparagus, apples, and tea. The first part of the chapter deals with the classification of phytochemicals and nutraceuticals followed by the description of rutin, dietary sources, the chemistry of rutin, and the biological and pharmacological properties of rutin. The facts and details of rutin described in the chapter provide an insight that rutin is a promising phytochemical and nutraceutical with numerous pharmacological activities. Rutin can be considered as a 'vital nutraceutical' and should be incorporated in human diets to get therapeutic benefits.

Keywords: phytochemical, rutin, nutraceutical, human health

Introduction

Phytochemical is a collective term for plant chemicals with varied structures and functions. In plants, they may serve different functions for protection and reproduction, such as color and odor for protection and insect attraction for pollination, phytoalexins for pathogen defense, hormonal functions for growth and signaling, antifeedants and toxins for insect protection, and allelochemicals for defense against herbivory. Phytochemicals are described as non-essential nutrients (non-essential means they are not required to sustain life) found in plant foods that are beneficial to promote

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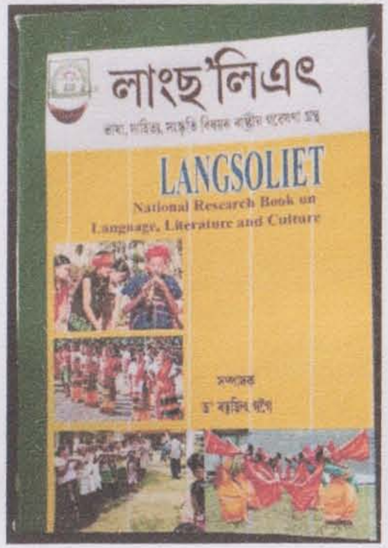

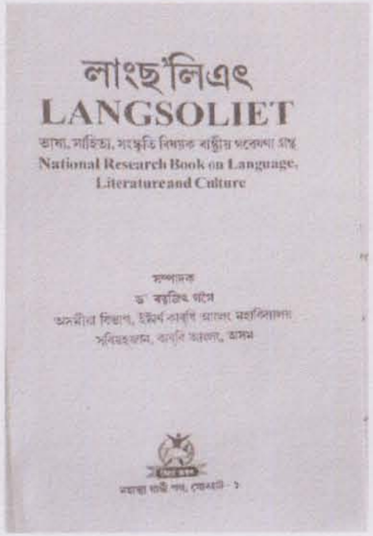
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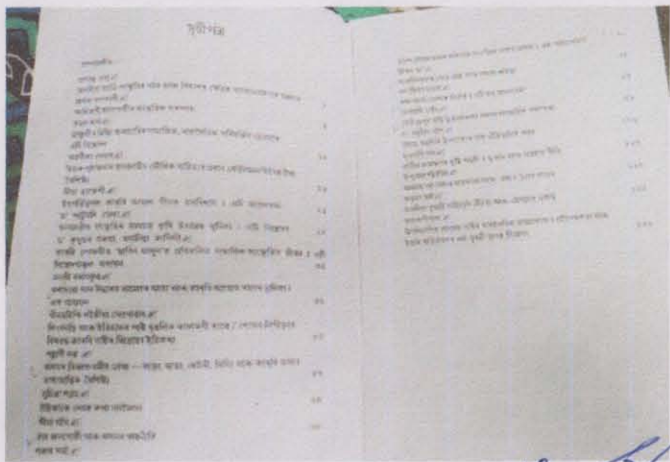
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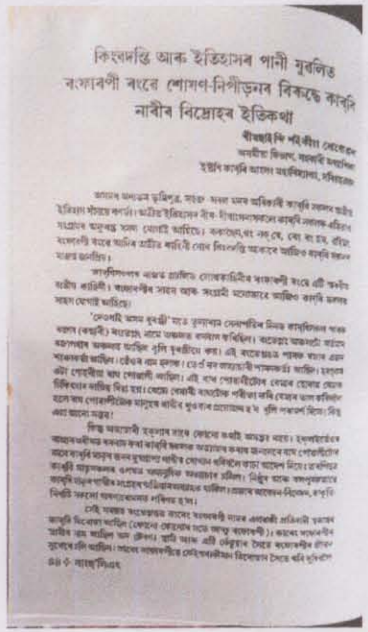
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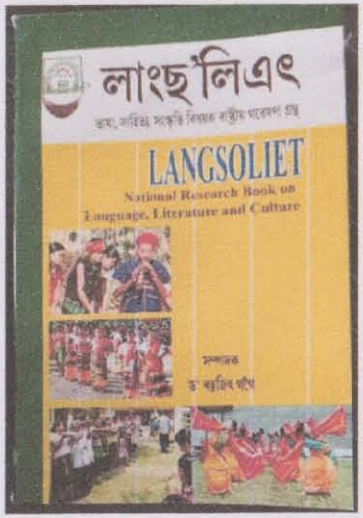

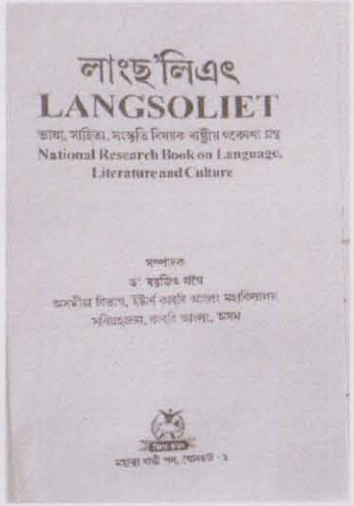

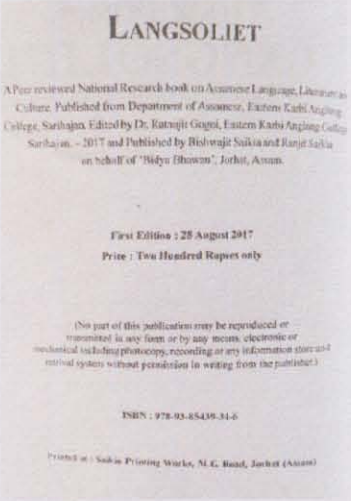

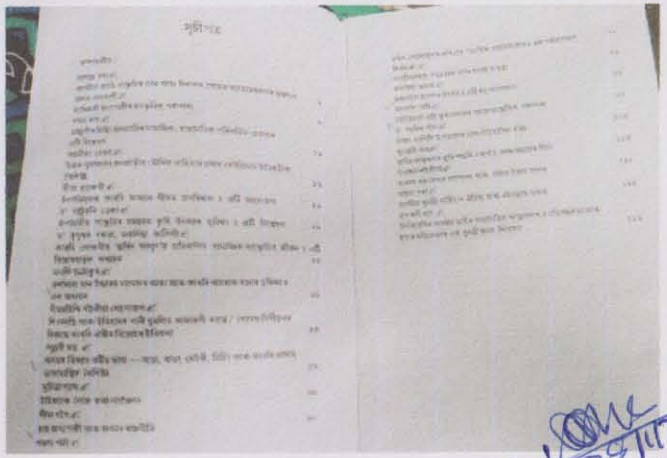

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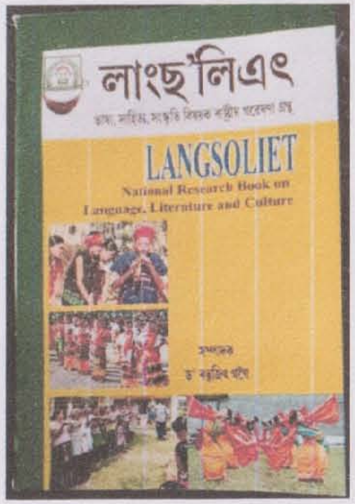

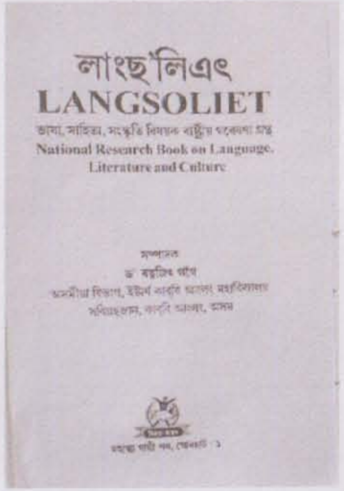

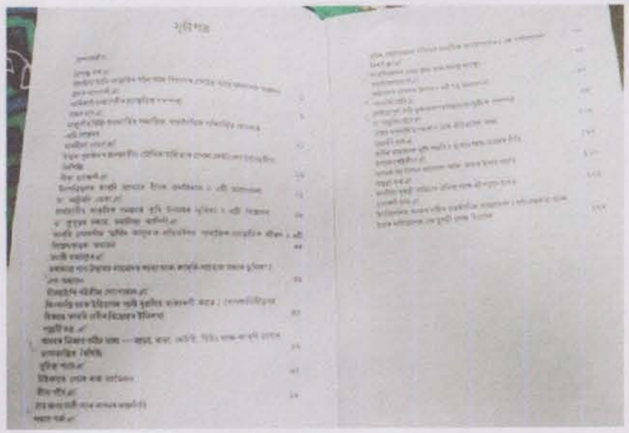

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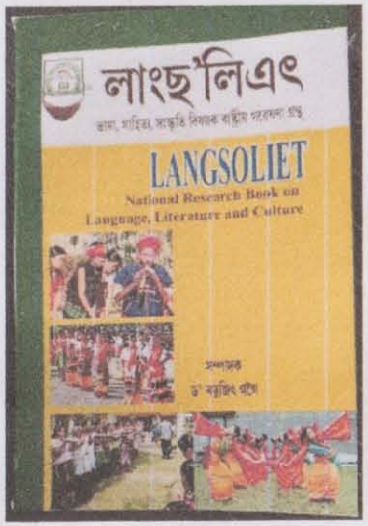

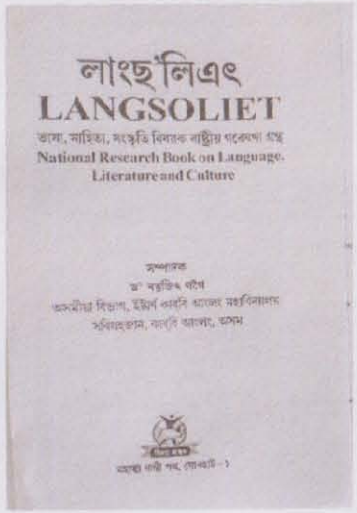

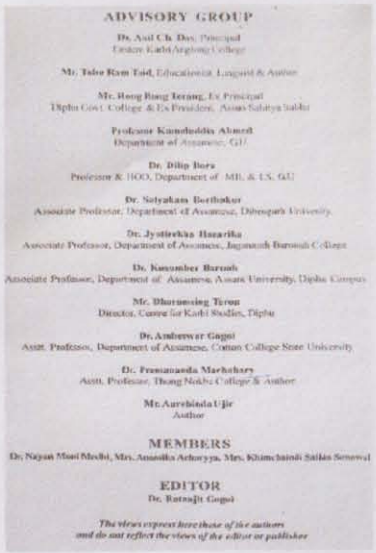

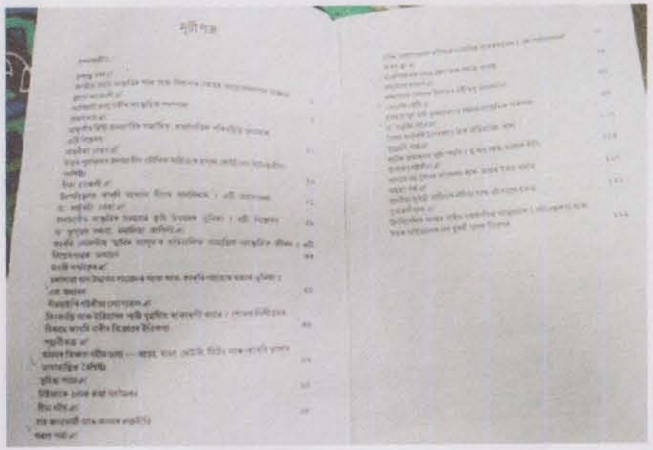

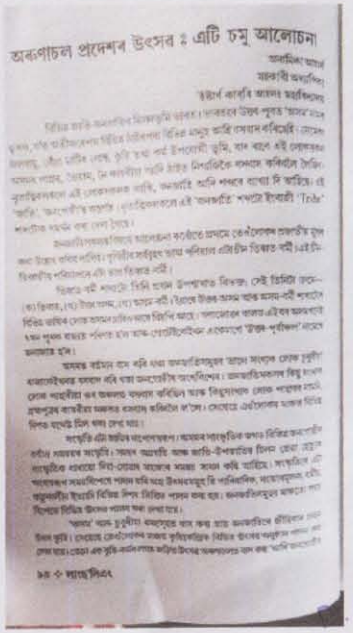

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Chapter title: Synthesis and characterization of MgO nanoparticle and its *in-vitro* cytotoxic effect on erythrocyte

Synthesis and Characterization of MgO Nanoparticle and Its In Vitro Cytotoxic Effect on Erythrocytes

Bitopan Boro, Anup Kr. Nath, Manash Barthakur, and Pankaj Kalita

Abstract Nanomaterials have moved into modern biological and medicinal implications for the advancement of biomedical applications. Magnesium oxide is a basic oxide of interest that has many applications in catalysis, adsorption, and synthesis of refractory ceramics as well as in the biological system. Magnesium oxide nanoparticles are characterized with a wide variety of applications and are mass-produced throughout the world. However, questions remain regarding its safety. There has been paucity of toxicology research on its side effects, especially under in vivo conditions. The present paper aims at evaluating the toxicity of chemically synthesized magnesium oxide nanoparticles in erythrocytes or red blood cells (RBCs). The synthesized MgO nanoparticles were characterized using UV-Vis spectroscopy, DLS, FTIR, and TEM analysis. The synthesized MgO showed hemolytic activity in a dose-dependent sequence. Size and charge characteristics of MgO observed supposed to be the influencing factor for the toxicity to the erythrocytes. Functionalization and surface modification of the synthesized MgO will help in its better applicability in biomedical science.

Keywords Nanoparticle · MgO · Erythrocytes · Cytotoxicity

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Chapter title: Biomedical application of nanoparticles for channel protein modulation to control neural disorder with special reference to seizure

Sudip Paul *Editor*

Application of Biomedical Engineering in Neuroscience

Springer

Biomedical Application of Nanoparticles for Channel Protein Modulation to Control Neural Disorder with Special Reference to Seizure

17

Pankaj Kalita and Manash Barthakur

Abstract

Channel proteins are the regulators of entry and exit of different molecules and ion to and fro from the cells. Regulation of entry and exit of molecules through different channel proteins can control different disorders. Therapeutic agents are used to target the channel protein to regulate ionic entry. Engineered channel proteins are developed to modify the channel protein movement. Epilepsy, which is marked by repeated seizures, is one of the serious neural disorder prevailing worldwide. Epileptic disorder is an electrophysiological alteration in the neuronal level and these electrophysiological changes are regulated by inward and outward movement of sodium, calcium, potassium, chloride ions, etc. Ions move through different channel proteins, and their movements are regulated by different channel proteins. These channel proteins are charge dependent and can be modulated by charged molecules. Nanoparticles are charged molecules and can be used to modulate channel proteins. Besides, nanoparticles have some exceptional properties than its raw materials which are helpful in the drug delivery approach. In the present article, it is targeted to focus and highlight the structural and functional approach of channel proteins and application of nanoparticles to control channel protein regulation which can help control different neural disorders including seizure.

Keywords

Channel protein · Therapeutic agent · Seizure · Nanoparticle

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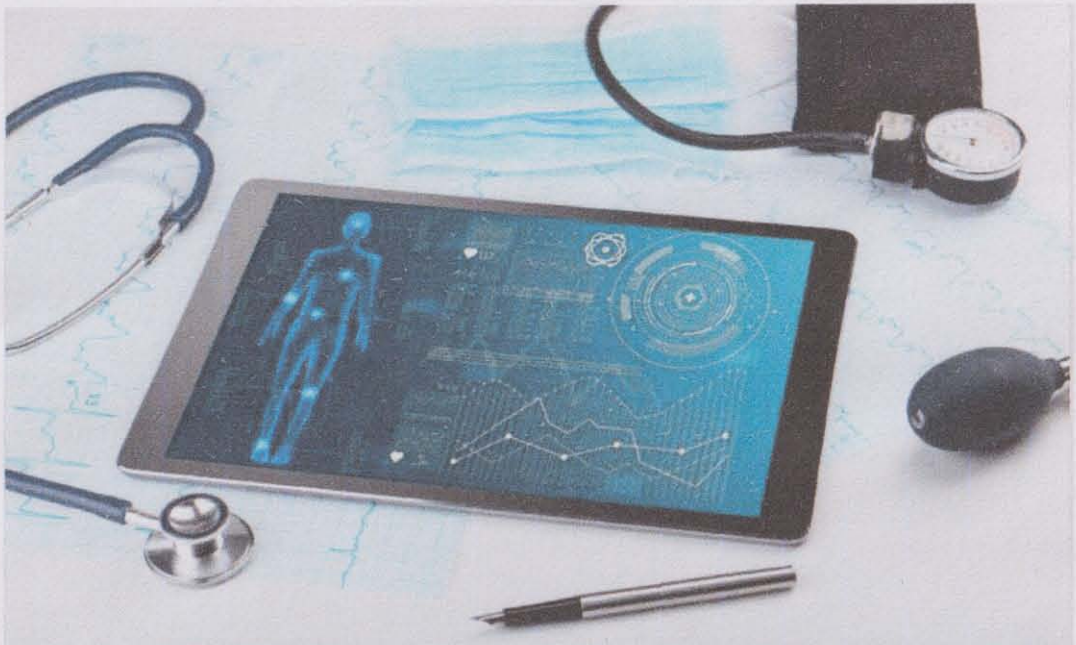
Chapter title: Preparation and characterization of gold nanoparticles conjugated insulin



Smart Healthcare for Disease Diagnosis and Prevention

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CHAPTER 5

Preparation and characterization of gold nanoparticles conjugated insulin

Chayanika Devi[1], Pankaj Kalita[1], Devashis Choudhury[2] and Manash Barthakur[3]
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[2]Physical Science Division, IASST, Guwahati, India
[3]Department of Zoology, Pub Kamrup College, Kamrup, India

5.1 Introduction

Insulin is an endogenous chemical regulates different physiological activities of the body including regulation of blood glucose level. Beside regulation of blood glucose level, different neurological disorder can be controlled by exogenous administration of insulin. To control the sugar level in a diabetic patient regular administration of insulin is necessary [1]. Insulin is a protein hormone and cannot administer through oral route. The only route of exogenous insulin administration is intramuscular injection. Regular insulin injection is a serious problem for the patient. So, an alternate route of insulin administration is important.

It is believed that insulin in conjugation with other micro and nano particles can be administered through other routes subject to retain the physiological effect of insulin action in conjugated form. So, present work has been designed to conjugate insulin with gold nanoparticles.

5.2 Materials and methods

There are different methods of insulin conjugation with gold nanoparticle. To conjugate insulin with gold nanoparticle, citrate stabilized gold nanoparticles and exogenous insulin was used.

To prepare citrate stabilized gold nanoparticles, gold chloride (chloroauric acid) and sodium citrate was used. 20 mL of Chloroauric acid 1.0 milli molar concentration are prepared and kept at 60 degree centigrade on magnetic stirrer. 2 mL of 1% Sodium citrate was mixed immediately with chloroauric acid. Change in color of gold chloride (Chloroauric acid) indicates the formation of gold nanoparticles.

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Chapter title: Discriminant correlation-based information fusion for real-time biomedical signal clustering

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Discriminant Correlation-Based Information Fusion for Real-Time Biomedical Signal Clustering

Anil Hazarika, A. Sarmah, M. Boro, P. Kalita and B. K. Dev Choudhury

Abstract Increasing availability of multiple responses and requirement of thorough analysis demand efficient modeling to derive a feasible support system which can make the analysis less-onerous, time-consuming, error-prone. Further, it is an indispensable provision to develop compact health monitoring devices, utility, and reliability of which rely on efficiency of program embedded that can manage the jobs without intervention of clinicians. In this article, a feature-level fusion framework is addressed using discriminant correlation analysis to effectively classify electroencephalogram (EEG) templates. Experiment on EEG data set shows that proposed method is efficacious and promising in terms of accuracy in comparison to the state of the art methods.

Keywords Feature-level fusion · Discriminant correlation · And electroencephalogram (EEG)

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Chapter title: A subspace projection based feature fusion: An application to EEG clustering

A subspace projection based feature fusion: An application to EEG clustering

A. Sarmah | A. Hazarika | P. Kalita | B K Dev Choudhury View All Authors

Abstract: Goal: In most decision models, feature biasing (FB) is the major concern that greatly impacts the performance management burden. The objective of this framework is to pre... **View more**

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Abstract:
Goal: In most decision models, feature biasing (FB) is the major concern that greatly impacts the performance management burden. The objective of this framework is to present a multi-view feature fusion strategy using canonical correlation analysis (CCA) that can effectively classify various classes of Electroencephalogram (EEG) patterns. Method: To make the best use of inherent class information, we first created multi-view vectors (MVVs) registering templates (i.e., signals) associated with study specific class groups through a given strategy, followed by projection to extract compact views, which are then fused via parallel fusion and then, applied to classification. Results: On EEG data, the learned patterns effectively represent underlying information they were trained, with significant performance in terms of markers. Further, its comparison with state-of-the-arts manifests the efficacy of adopted model. Conclusion: The methodology effectively classify various EEG patterns. Significance: The significant reduction of complexity and dimensionality with enhanced information space envisages the possible extension of this work to alleviate the onus of clinician of large volume data and also expedite the large scale research.

Published in: 2017 International Conference on Signal Processing and Communication (ICSPC)

Chapter title: Drug Discovery Approaches and the Role of Plant Products in Treating Neuronal Disorders

PHYTOCOMPOUNDS

Sources and Bioactivities

About the Book

This book provides a systematically reviewed up-to-date information on several aspects of bioactive phytocompounds, their natural resources and production. Several classes of phytocompounds, such as phenolics, flavonoids, alkaloids, glycosides, etc., and their prospective biomedical applications are discussed along with their pharmacological importance. Phytocompounds and their curative properties against various human diseases, including cancer, diabetes, atherosclerosis, neurological diseases, skin diseases, other microbial infections, rheumatic pains, fever, and many more are discussed. Further, the occurrence of less explored medicinal plants and their pharmacologically active phytocompounds have been emphasized in this book. This information will be very useful for the scientific community to further examine for many other unknown compounds and their potential pharmacological benefits in detail. Topics covered in this book include medicinal plants ethnopharmacology, phytochemistry, extraction methods, challenges in medicinal plants cultivation, use of biotechnological approaches, toxicological effects, clinical studies, mode of action, targeted therapy, newly identified potential phytocompounds, novel drug discovery approaches, and drug delivery strategies including computational approaches and nanobiotechnology are discussed in detail. Overall, this book will be a valuable resource for researchers to work towards identifying and characterizing new phytocompounds possessing bioactivity from a diversified flora, and to enable the discovery of novel therapeutic leads in the near future against various human ailments. Besides this, the book will produce a good information for the students, teachers, scientists, and research professionals involved in the drug discovery research.

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PHYTOCOMPOUNDS
Sources and Bioactivities

Mallappa Kumara Swamy
Gudepalya Renukaiah Rudramurthy

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Drug Discovery Approaches and the Role of Plant Products in Treating Neuronal Disorders

PICHILI VIJAYA BHASKAR REDDY[1*], CHADIPIRALLA KIRANMAI[3] AND PANKAJ KALITA[1,2]

ABSTRACT

Phytotherapy plays a key role in traditional medicine system in the management of diseases. Traditional medication practices have been serving as an effective alternative source of medicine among many societies in spite of the availability of well-established drug therapy. Natural products have been playing vital role in the traditional treatment as well as in medication system for hundreds of years, in parallel with the development of the pharmaceutical industry. These natural products contain complicated mixtures of organic chemicals, which may include fatty acids, sterols, alkaloids, flavonoids, glycosides, saponins, tannins, terpenes and so forth. Use of medicinal plants against neurological disorders is an age old practice. The traditional system of utilizing medicinal plants is effectively applied to improve the brain function. The pharmacogenic plant extracts interact with the targeted signaling pathways affecting the pharmacology and thereby potentially playing a role in human disease and treatment. Neural drugs work by balancing of particular chemicals (neurotransmitters) or by selective enhancement of cerebral blood flow, cerebral oxygen usage, metabolic rate

[1] Department of Life Science and Bioinformatics, Assam University, Diphu Campus, Karbi Anglong, Assam, India.

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[3] Department of Biotechnology, Vikrama Simhapuri University, Nellore, Andhra Pradesh, India

**Corresponding authors*: vpichili@gmail.com; vbreddyasuh@yahoo.com

Chapter title: Concept of Biodiversity

The book is a collection of articles written by a group of eminent scientist working in the field of Biodiversity of N E India. The book covers the topics starting from concept on biodiversity to microbial, floral and faunal diversity of N E India including their conservation strategies. Some of the articles included are pioneers of botanical exploration, algal diversity, medicinal and aromatic plants diversity, pteridophytes, fish diversity, reptiles, birds and diversity of primates. The last chapter is on ecosystem diversity of the area.

Dr. Dipak Konwar is Assistant professor in the Department of Botany, Pub Kamrup College, Baihata Chariali, Kamrup, Assam. His research area is soil micro biology and he is engaging himself for environmental education among the students.

Pankaj Kalita is a Senior Research Fellow in DBT sponsored Institutional Level Biotech Hub of Pub Kamrup College, Baihata Chariali, Kamrup, Assam. He is working for his Ph.D. under Assam University Diphu Campus. His field of interest is Neuro Science and traditional knowledge.

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A Glimpse of **Biodiversity in India**

Dipak Konwar
Pankaj Kalita

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A Glimpse of

Biodiversity in India

Dipak Konwar • Pankaj Kalita

Contents

1 Concept of Biodiversity

Pichili Vijaya Bhaskar Reddy
Chadipiralla Kiranmai
Pankaj Kalita

Introduction

Diversity among the biological environment is meant by the word biodiversity, contracting the phrase biological diversity. It is defined as the measurement of total association of genes, species and ecosystem exploring the richness and variety of life. Biodiversity of a location is the measure of variety and richness of different organisms and biological environment in the selected area.

Levels of biodiversity

The term biodiversity is described at three levels: Genetic diversity, Species diversity and Ecosystem diversity. All these three levels are interrelated. However, they are significantly distinct enough to be studied as three separate entities. Although few of the researchers are of the opinion that there exist more diverse levels of biodiversity, these three levels are a good number to work with and discuss.

Genetic diversity: Genetic diversity refers to the variation of genes within a species. This diversity is due to the different gene combinations possible in the genetic set up of an organism that gives its specific characteristics. Genetic variation is extremely important to the survival of species. Genetic variability, that is majorly responsible for these different traits, interact with local environmental conditions to determine the extent to which populations can adapt to environmental changes and survive when exposure to new conditions or diseases. It enables a population to adapt to its environment and to respond to

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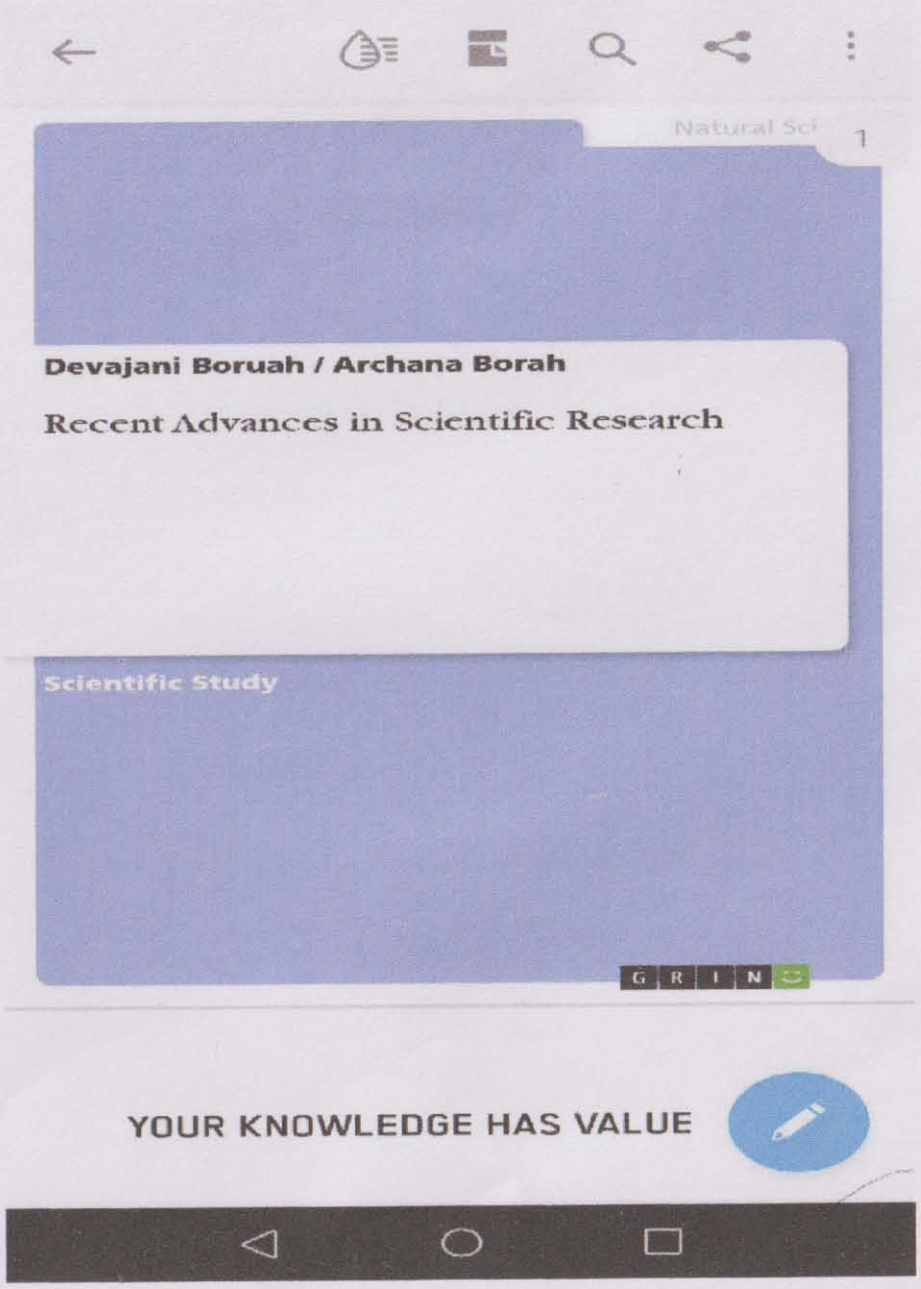

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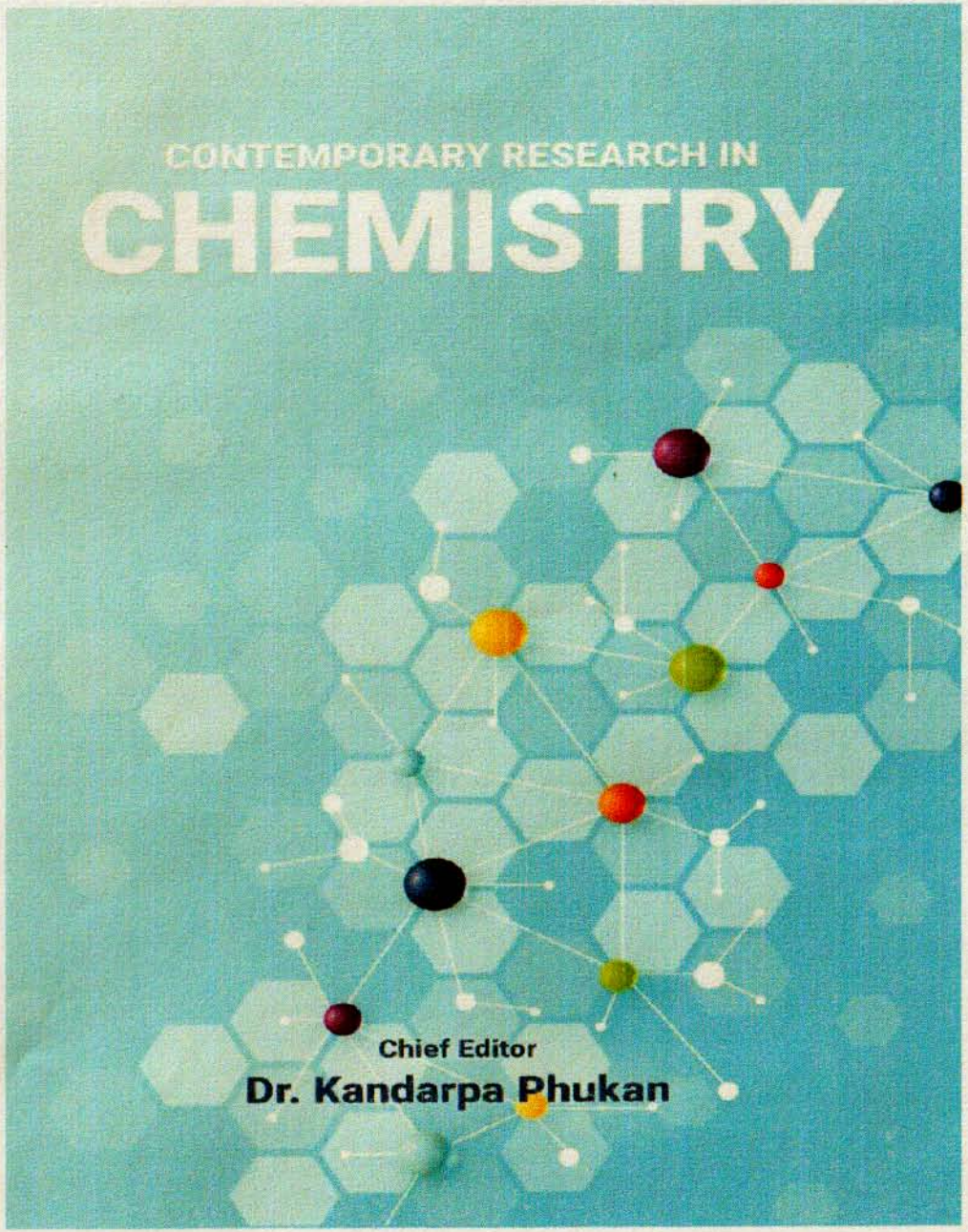
Chapter 3

Phytochemical studies and traditional use nature's most valuable plant of Bael (Aegle marmelos) in Assam

Dr. Monmi Saikia, and Bidanshree Basumatary

Introduction

From the early days mankind is using plant source to alleviate or cure illnesses. Plants constitute a source of novel chemical compounds which of potential use in medicine and other application. Alkaloids, steroids, tannins, glycosides, volatile oils, fixed oils, resins, phenols and flavanoids are present as active components in plant, which are deposited in their specific parts such as leaves, flowers, bark, seeds, fruits, roots, etc [1]. World is bestowed with a rich wealth of medicinal plants. Man cannot survive on this earth for long life without the plant kingdom because the plant products and their active constituents played an important role [2]. Plants have been utilized as a natural source of medicinal compounds since thousands of years and human is using numerous plants and plant derived products to cures and relief from various physical and mental illness [3]. Photochemicals (a Greek word: phyto means plants) are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans further than those attributed to macronutrients and micronutrients. They protect plants from disease and damage and contribute to the plant's color, aroma and flavour. In general, phytochemicals are the plant chemicals that protect plant cells from environmental hazards such as pollution, stress drought, UV exposure and pathogenic attack; where they



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CHAPTER 15

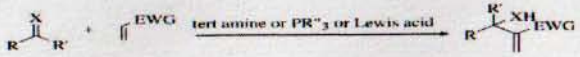
Prospective of Baylis-Hillman adducts as Future Drug: An Analysis

Monmi Saikia

Abstract: This article aims to present Baylis-Hillman adducts (BHA) as a new class of bioactive molecule and highlights their potentialities for the discovery of new different efficient drug molecules. Here we will discuss the diverse bio-activities of different BHA, prepared from different starting materials. Various biological activities have been demonstrated, such Lethal against Biomphalaria, anti-Plasmodium falciparum and Plasmodium berghei (parasites that cause malaria) Glabrata (Schistosomiasis snail transmitter), antibacterial, antifungal, herbicide, and active ingredients against certain cell lines of human tumours.

1. Introduction

Baylis-Hillman reaction (Baylis & Hillman, 1972) is a three component atom-economic carbon-carbon bond formation reaction of generally a carbon electrophile, an activated alkene or alkyne and a base to form densely functionalized products in a catalytic process without generating a waste or by-products. The densely functionalized molecule is called Baylis-Hillman adduct and these adducts are very useful as synthons in a number of synthetic processes due to the proximity of functional groups. Recent trend in organic synthesis have clearly established that the development of a reaction is dependent on two main criteria: atom-economy and selectivity (chemo-, regio-, stereo-), where Baylis-Hillman reaction follows these two criteria.



R= aryl, alkyl heteroaryl; R'= H, COOR, alkyl; R"= aryl,alkyl
X= O, NCOOR, NTs, NSO_2Ph, $NP(=O)R_2$, $NPPh_2$ etc
EWG= COR, CHO, CN, COOR, $PO(OEt)_2$, SO_3Ph, SO_2Ph, SOPh, $CONR_2$, COSR etc

Scheme 1

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আৰ. কে. ৰোড
নগাঁও (অসম)

প্রচ্ছদ পৰিকল্পনা ঃ অঙ্কিতা সাহা

মূল্য ঃ ২৫০ টকা

সম্পাদনাত
জয়ন্তী সাহা, এম.এ.(ডাব্'ল্), এম.ফিল., পি-এইচ.ডি.
ৰঞ্জয় সাহা, এম.এ.(ট্রিপ্'ল্),

মুদ্রণ ঃ স্বপ্না প্রেছ এণ্ড গ্লাছ্হইন
জে. এম. ৰোড, নগাঁও

বিবিধ প্রবন্ধ
ISBN 978-81-202-8806-8

অসমীয়া আৰু বাংলা ভাষাৰ ৰচিত 'ভাৰত ত্যাগ আন্দোলন' কেন্দ্রিক উপন্যাসৰাজিৰ এটি তুলনামূলক আলোচনা

ড° নয়নমণি মেধি

অৱতৰণিকা ঃ

বৃটিছ ঔপনিৰেশিক গ্রাসৰ পৰা মুক্তি বিচাৰি ভাৰতীয় জনগণে চলোৱা দীর্ঘদিনীয়া স্বাধীনতা সংগ্রাম বিশ্বৰ ৰাজনৈতিক ইতিহাসত এটি গুৰুত্বপূর্ণ ঘটনা। প্রায় দুই শতিকাজোৰা ঔপনিৰেশিক শাসন-শোষণৰ এই কালছোৱাত দেশৰ স্বাধীনতাকামী সংগ্রামীসকলে অশেষ ত্যাগ, অদমনীয় মনোবল আৰু প্রবল সংগ্রামী দৃঢ়তাৰে যুঁজ দিয়াৰ বিনিময়ত অৱশেষত 1947 চনৰ 15 আগষ্ট তাৰিখে ভাৰতবর্ষই স্বাধীনতা লাভ কৰে। ভাৰতৰ স্বাধীনতা আন্দোলনৰ এই যুগান্তকাৰী ঘটনাক উপজীব্য কৰি প্রধান ভাৰতীয় ভাষাসমূহত এলানি উপন্যাস ৰচিত হৈছে।

স্বাধীনতা সংগ্রামৰ অন্তিম পর্বত যি অভূতপূর্ব গণ-জাগৰণে সমগ্র ভাৰতবর্ষ কঁপাই তুলিছিল, সেই পর্ব 'ভাৰত ত্যাগ আন্দোলন' বা 'বিয়াল্লিছৰ গণবিপ্লৱ' হিচাবেই খ্যাত। জাতীয় কংগ্রেছৰ দ্বাৰা পৰিচালিত আন্দোলনৰাজিৰ ভিতৰত 1942 চনৰ জাগৰণেই আছিল সকলোতকৈ ব্যাপক আৰু জংগী। দ্বিতীয় বিশ্বযুদ্ধৰ পৰিস্থিতিত বৃটিছ ঔপনিৰেশিক চৰকাৰৰ বিৰুদ্ধে পৰাধীন ভাৰতবাসীৰ স্বতঃস্ফূর্ত ৰণখনেই গণ আন্দোলনৰ ৰূপ পৰিগ্রহণ কৰে। অন্যান্য ভাৰতীয় ভাষাসমূহৰ লগতে অসমীয়া আৰু বাংলা ভাষাত ৰচিত হোৱা ভাৰত ত্যাগ আন্দোলন কেন্দ্রিক উপন্যাসৰাজিৰ এটি তুলনামূলক বিচাৰ এই প্রবন্ধত দাঙি ধৰাৰ প্রয়াস কৰা হৈছে।

সূচীপত্র

b. **"Upanyash Somaluchak Dr. Satyendranath Sarma "**

সূচীপত্র

Saraswata Sadhak Adhyapak Satyendranath Sarma : *A collection of Articles on life & contribution of Professor Satyendranath Sarma and published by the Department of Modern Indian Languages & Literary Studies, Gauhati University, Guwahati-781014*

***Price :** Rs. 350.00*

প্রকাশক
আধুনিক ভাৰতীয় ভাষা আৰু সাহিত্য অধ্যয়ন বিভাগ
গুৱাহাটী বিশ্ববিদ্যালয়

প্রথম প্রকাশ ঃ নবেম্বৰ, ২০১৬

প্রকাশকৰ দ্বাৰা সর্বস্বত্ব সংৰক্ষিত

বেটুপাত ঃ চন্দন দাস

মূল্য ঃ তিনিশ পঞ্চাশ টকা

অক্ষৰ বিন্যাস ঃ ভাৰতী দাস

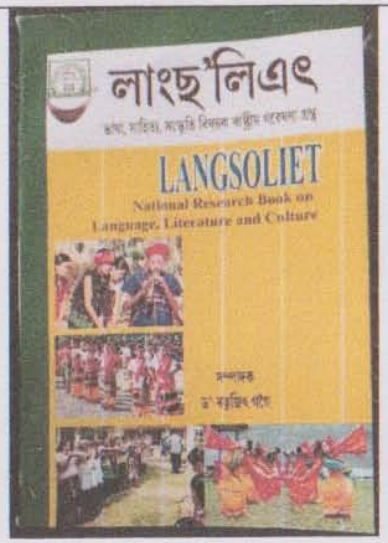
ছপা ঃ ভবানী অফছেট এণ্ড ইমেইজিং ছিষ্টেমছ্ প্রাঃ লিঃ, গুৱাহাটী

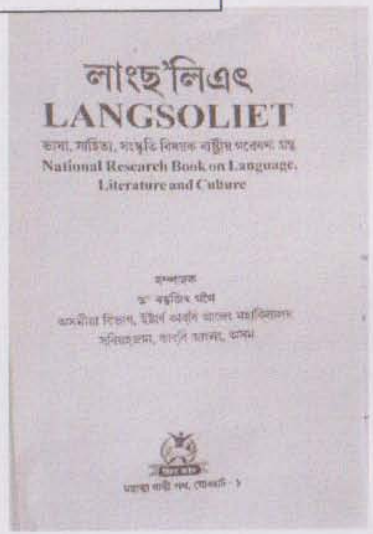
উপন্যাস সমালোচক ড° সত্যেন্দ্রনাথ শর্মা

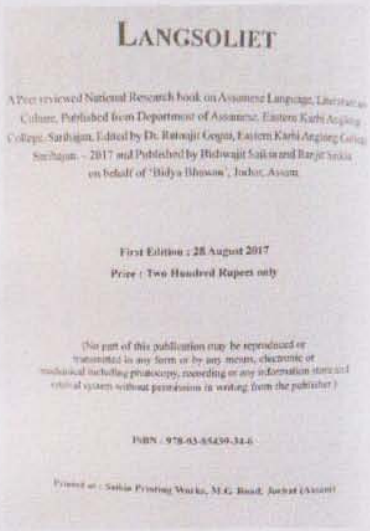
ড° নয়নমণি মেধি

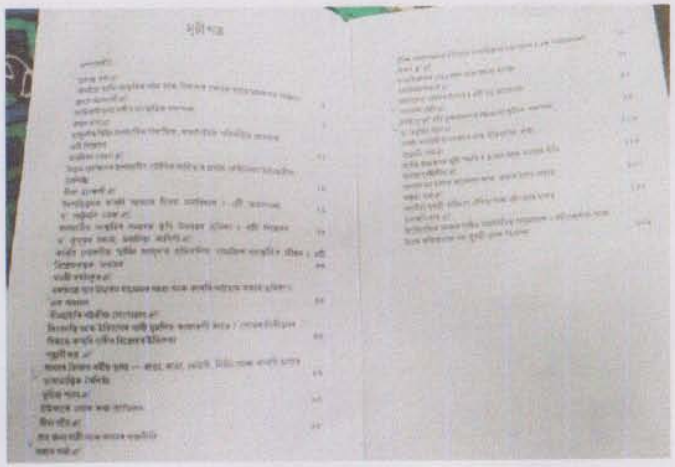
জোনাকী যুগত অসমীয়া উপন্যাস সাহিত্যৰ উন্মেষ ঘটিল যদিও 'জোনাকী'ৰ পাতত উপন্যাসৰ কোনো সমালোচনা প্রকাশ নহ'ল। আৰম্ভণি কালৰ প্রসিদ্ধ ঔপন্যাসিক 'উপন্যাস সম্রাট' হিচাপে খ্যাত ৰজনীকান্ত ৰৱদলৈকে অসমীয়া সাহিত্যত উপন্যাসৰ আদিতম সমালোচক বুলি অভিহিত কৰিব পাৰি। দীননাথ শর্মা সম্পাদিত 'আৰাহন' পত্রিকাত তেওঁ ইংৰাজী আৰু বাংলা কেইখনো উপন্যাসৰ সমালোচনা অথবা সমীক্ষা দাঙি ধৰিছিল। পত্রিকাখনত ৰৱদলৈয়ে আনকি নিজৰ 'মিৰি জিয়ৰী' উপন্যাসৰো বিশ্লেষণাত্মক আলোচনা আগবঢ়াইছিল। পণ্ডিত অধ্যাপক ড° বাণীকান্ত কাকতিয়ে সমালোচক হিচাপে আত্মপ্রকাশ কৰি অসমীয়া সমালোচনা সাহিত্যক প্রণালীবদ্ধ ৰূপ প্রদান কৰে। সাহিত্য কর্মসমূহক প্রথমতে গাইগুটীয়াকৈ সাহিত্যৰ দৃষ্টিকোণেৰে গুণাগুণ বিচাৰ কৰি চাই পাছত আটাইবোৰ ৰচনাৰে সমষ্টিগতভাৱে মূলসূত্র বিচাৰ কৰাটোৱেই আছিল ড° কাকতিৰ সমালোচনাৰ মূল ৰীতি। ৰীণা ৰৱৰা ছন্নমেৰে প্রকাশিত বিৰিঞ্চি কুমাৰ ৰৱৰাৰ অসামান্য কৃতি 'জীৱনৰ বাটত' উপন্যাসখন প্রকাশ পোৱাৰ চাৰি বছৰৰ পাছতেই ড° কাকতিয়ে উপন্যাসখনৰ গুৰুত্ব উপলব্ধি কৰি এটি সুন্দৰ সমালোচনা আগবঢ়াইছিল। ড° কাকতিৰ মতে উপন্যাসখনত "গাঁৱলীয়া জীৱনৰ যি নিমজ ছবি ফুটি উলাইছিল, গাঁৱলীয়া জীৱনৰ ক্ষুদ্র আকাঙ্খা আৰু হা-হুতাশৰ যি তপত ভাপ সি অতিশয় মনোমোহা। তাৰ চিত্র আৰু বর্ণনাবোৰ দেখিলে মনত পেলাই যেন অসম দেশক এতিয়াহে চিনি পালোঁ।"[১] ড° কাকতিৰ এনে উচ্চ প্রসংশাৰ

c. Boichitrapurna Tai -Turungsokolor Samaj – Sangskritik Parampora









d. " Rajniti Aru Asomiya Upanyash "

BORLUIT- A Commemorative Volume, edited by Yugal Jyoti Borah and published by Pragjyotika Kabya Kanan, No. 1. Borjangaon, Golaghat-785610 on behalf of Celebration Committee, 5th Biennial State Conference,Asomiya Sahitya Sanmilanee, Doyang College, Merapani, Golaghat-785705, Assam. Printed at Arindam Pritners, ,Guwahati. Price Rs. 250/ Only.

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ৰৰলুইত

স্মাৰক গ্ৰন্থ

পঞ্চম দ্বি-বাৰ্ষিক ৰাজ্যিক অধিবেশন,

অসমীয়া সাহিত্য সম্মিলনী, দৈয়াং মহাবিদ্যালয়।

সম্পাদনা সমিতিঃ

উপদেষ্টা ঃ ড° চৌধুৰী নাথ শইকীয়া
অশোক দাস

সভাপতি ঃ মনোজ কুমাৰ শইকীয়া

সম্পাদক ঃ যুগলজ্যোতি ৰৱা

সম্পাদনা সহযোগী ঃ দ্বীপেন ৰৱা,
পিংকু শইকীয়া

দৈয়াং বিশেষ'ৰ তত্বাবধায়ক ঃ দেৱযানী ৰৱগোহাঁই ৰৱৱা, দিপেন ৰৱা

প্ৰকাশকাল ঃ ৭ ফেব্ৰুৱাৰী, ২০২১

প্ৰকাশক ঃ উদ্‌যাপন সমিতিৰ হৈ প্ৰাগজ্যোতিকা কাব্য কানন, ১ নং ৰৱজান
গাঁও, গোলাঘাট - ৭৮৫৬১০, ফোন - ৯৪০১০৯৬৬৭৬ গোলাঘাট

অক্ষৰ বিন্যাস আৰু অঙ্গসজ্জা ঃ জোনাক প্ৰিণ্টাৰ্চ, মেৰাপানী, গোলাঘাট

প্ৰচ্ছদ ঃ মনজিৎ ৰাজখোৱা

ছপা ঃ অৰিন্দম প্ৰিণ্টাৰ্চ,গুৱাহাটী

মূল্য ঃ ২৫০/ মাত্ৰ

বিষয়সূচী —

বৰলুইত

অসমীয়া সাহিত্য সন্মিলনী

পঞ্চম দ্বি-বার্ষিক ৰাজ্যিক অধিবেশন, দৈয়াং মহাবিদ্যালয়, মেৰাপানী

দিনাংকঃ ৫, ৬ আৰু ৭ ফেব্রুৱাৰী,২০২১ খ্রীষ্টাব্দ

(২২, ২৩, আৰু ২৪ মাঘ, ১৯৪২শক)

সম্পাদক

যুগলজ্যোতি বৰা

ৰাজনীতি আৰু অসমীয়া উপন্যাস

নয়নমনি মেধি

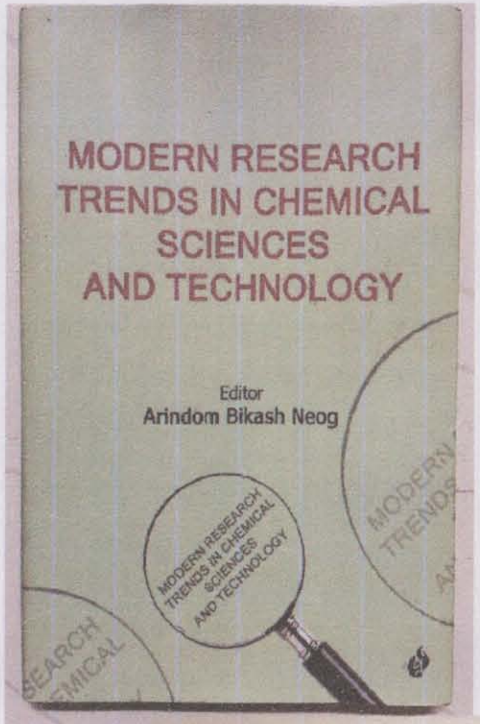
(এক)

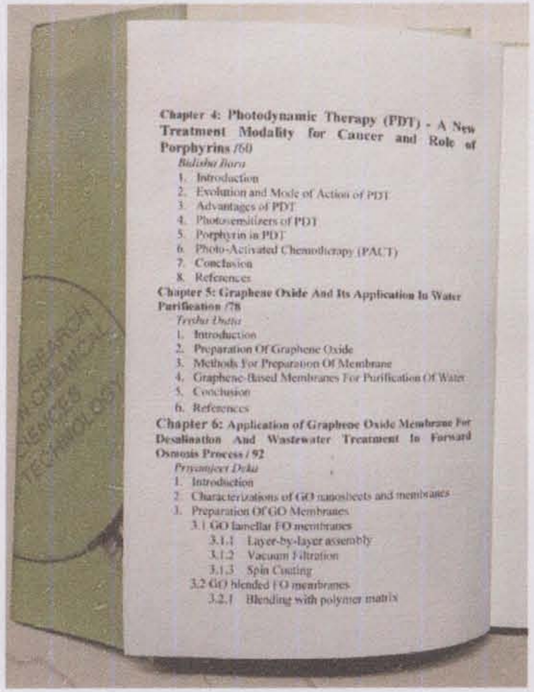
উপন্যাস হ'ল এক আধুনিক সাহিত্য কলা। প্রাচীন কাব্যৰ দৰে অলৌকিকতাৰ প্রৱেশ নিষিদ্ধ যদিও উপন্যাসক গদ্যৰ ৰূপত লিখা কাব্য বুলিয়েই অভিহিত কৰা হয়। সমালোচক ৰালফ্ ফক্সে (Ralph Fox) উপন্যাসক আধুনিক মধ্যবিত্ত সমাজৰ মহাকাব্যৰ সৈতে ৰিজাইছে, যদিও মহাকাব্য এখনৰ দৰে সমাজৰ পৰিপূর্ণ চিত্রৰ প্রতিফলন উপন্যাসত সম্ভৱ নহয়। দৰাচলতে উপন্যাসৰ আধাৰ হ'ল মানুহৰ বাস্তৱিক জীৱনধাৰা, সামাজিক আচৰণ আৰু সামাজিক পৰিস্থিতি। সমাজ-বাস্তৱতাৰ প্রতিফলক হিচাপে সমাজৰ সৈতে উপন্যাসৰ সম্বন্ধ অতি নিবিড়। একেদৰে ৰাজনীতিৰ সৈতেও আধুনিক কালৰ মানুহ আৰু সমাজৰ গভীৰ সম্পর্ক আছে। কেৱল সম্পর্কই নহয় ৰাজনীতিৰ সৈতে এইকালৰ মানুহৰ সম্পর্কও যেন ক্রমান্বয়ে একাত্ম হৈ পৰা পৰিলক্ষিত হৈছে। ৰাজনীতিক বাদ দি বর্তমান যুগৰ মানুহৰ জীৱন যাত্রা প্রায়অচল। ঔপন্যাসিক টমাছ মানৰ মতে এই কালৰ মানুহৰ ভাগ্যও ৰাজনীতিৰ দ্বাৰাই নিৰূপিত। এনে দৃষ্টিকোণৰ পৰা উপন্যাসত ৰাজনৈতিক চিন্তা-চেতনাৰ প্রৱেশ আৰু প্রতিফলন নিতান্তই স্বাভাৱিক কথা।

"ৰাজনৈতিক চেতনা" বোলা অভিধাৰ আজিকালি ব্যাপক প্রয়োগ হোৱা লক্ষ্য কৰা যায়। সাধাৰণভাৱে এই অভিধাৰ অর্থ ৰাষ্ট্র পৰিচালনা সংক্রান্তীয় নীতি বা ঘটনাৰাজিৰ সম্পর্কে ব্যক্তি তথা সমাজৰ জ্ঞান, বোধন দক্ষতা অথবা ৰাজনৈতিকভাৱে চিন্তা-চর্চা কৰিব পৰা মানসিক শক্তি বুলি ক'ব পাৰি। ৰাজনৈতিক চেতনা সম্পন্ন হোৱাটো মানুহৰ এক বিশেষ চাৰিত্রিক লক্ষণ বা গুণ বুলিব পাৰি। মানুহৰ এই ৰাজনৈতিক চিন্তা-চেতনাৰ প্রতিফলন সাহিত্যৰ অন্যান্য ৰূপসমূহৰ লগতে উপন্যাস কলাতো লক্ষ্য কৰা যায়। ৰাজনৈতিক প্রভাৱপুষ্ট উপন্যাসক আপাত দৃষ্টিৰে দুটা প্রধান শ্রেণীত বিভক্ত কৰিব পাৰি- (১) ৰাজনৈতিক উপন্যাস আৰু (২) ৰাজনৈতিক চেতনাসমৃদ্ধ উপন্যাস।

ৰাজনীতিক মূল বিষয়বস্তু অথবা ৰাজনীতি সৃষ্ট পৰিৱেশক উপজীব্য হিচাপে লৈ ৰচনা কৰা সামাজিক উপন্যাসৰাজিত ৰাজনৈতিক চিন্তা-চেতনাৰ প্রভাৱ আৰু প্রতিফলন লক্ষ্য কৰা যায়। সমকালীন সমাজক প্রভাৱিত কৰা ৰাজনৈতিক চিন্তা-দর্শনক বাস্তৱিকতে সামাজিক ঔপন্যাসিকেও উপেক্ষা কৰিব নোৱাৰে। এই বাবেই

12. The images of the book chapter of Trisha Dutta are as follows:

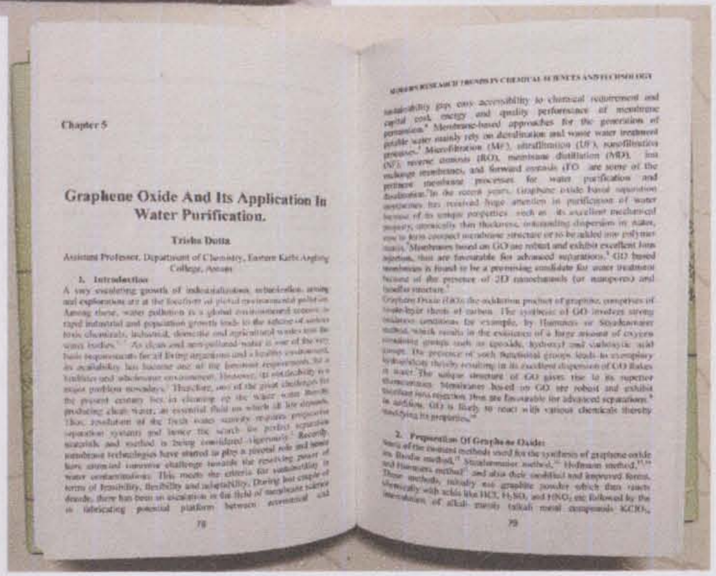




Chapter 4: Photodynamic Therapy (PDT) - A New Treatment Modality for Cancer and Role of Porphyrins /60
Bidisha Bora
1. Introduction
2. Evolution and Mode of Action of PDT
3. Advantages of PDT
4. Photosensitizers of PDT
5. Porphyrin in PDT
6. Photo-Activated Chemotherapy (PACT)
7. Conclusion
8. References

Chapter 5: Graphene Oxide And Its Application In Water Purification /78
Trisha Dutta
1. Introduction
2. Preparation Of Graphene Oxide
3. Methods For Preparation Of Membrane
4. Graphene-Based Membranes For Purification Of Water
5. Conclusion
6. References

Chapter 6: Application of Graphene Oxide Membrane For Desalination And Wastewater Treatment In Forward Osmosis Process / 92
Priyanjeet Deka
1. Introduction
2. Characterizations of GO nanosheets and membranes
3. Preparation Of GO Membranes
3.1 GO lamellar FO membranes
3.1.1 Layer-by-layer assembly
3.1.2 Vacuum Filtration
3.1.3 Spin Coating
3.2 GO blended FO membranes
3.2.1 Blending with polymer matrix



Chapter 5

Graphene Oxide And Its Application In Water Purification.

Trisha Dutta

Assistant Professor, Department of Chemistry, Eastern Karbi Anglong College, Assam

1. Introduction

2. Preparation Of Graphene Oxide

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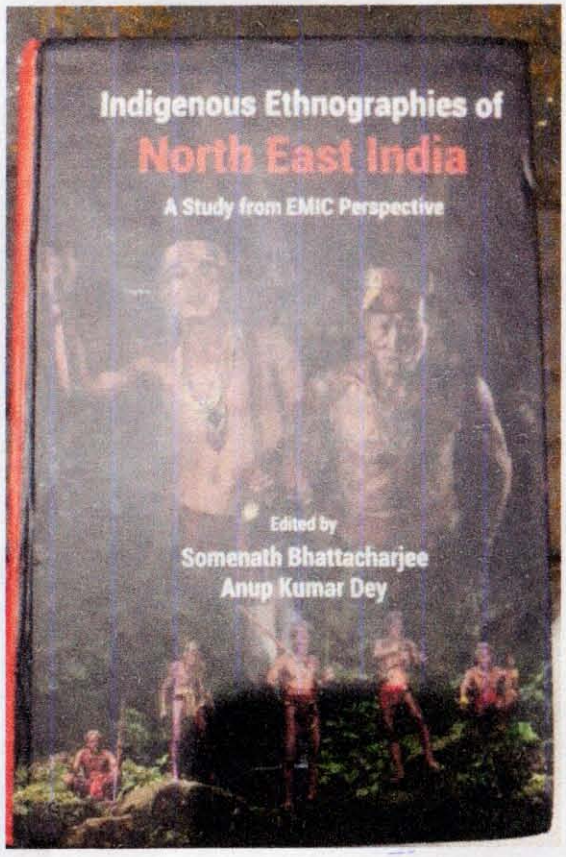

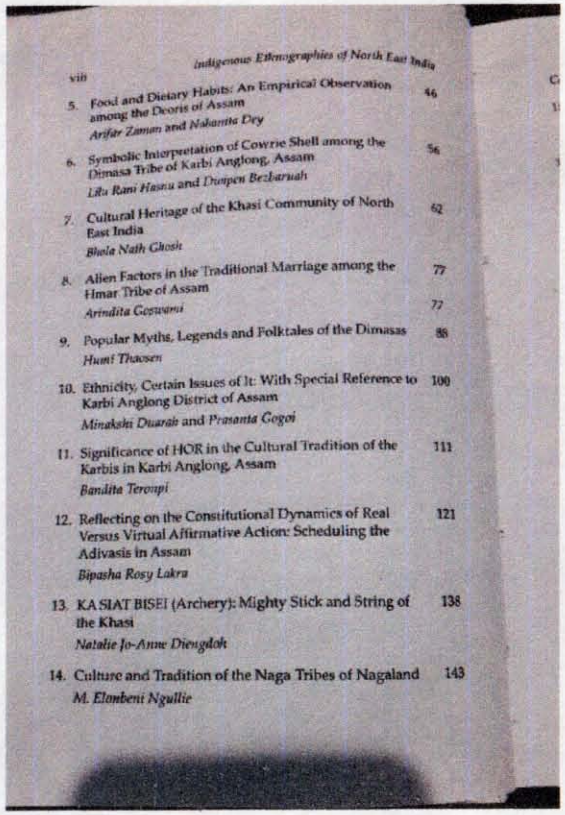

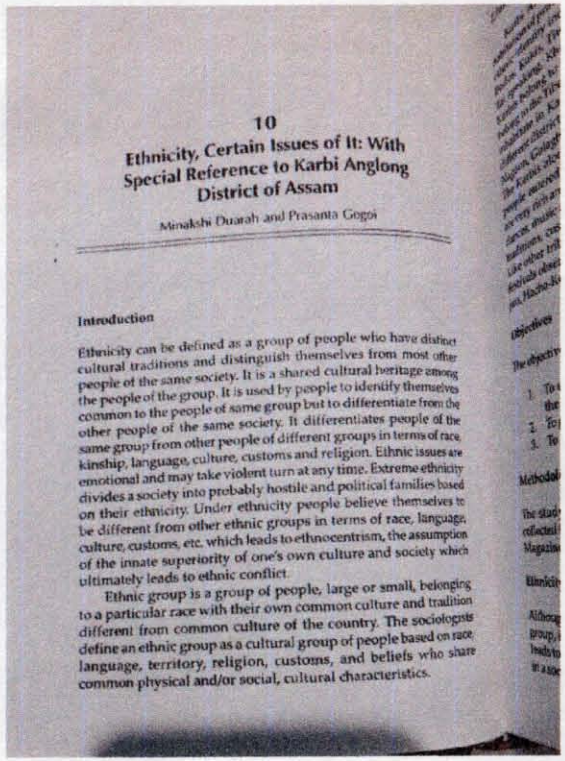

10
Ethnicity, Certain Issues of It: With Special Reference to Karbi Anglong District of Assam

Minakshi Duarah and Prasanta Gogoi

Introduction

Ethnicity can be defined as a group of people who have distinct cultural traditions and distinguish themselves from most other people of the same society. It is a shared cultural heritage among the people of the group. It is used by people to identify themselves common to the people of same group but to differentiate from the other people of the same society. It differentiates people of the same group from other people of different groups in terms of race, kinship, language, culture, customs and religion. Ethnic issues are emotional and may take violent turn at any time. Extreme ethnicity divides a society into probably hostile and political families based on their ethnicity. Under ethnicity people believe themselves to be different from other ethnic groups in terms of race, language, culture, customs, etc. which leads to ethnocentrism, the assumption of the innate superiority of one's own culture and society which ultimately leads to ethnic conflict.

Ethnic group is a group of people, large or small, belonging to a particular race with their own common culture and tradition different from common culture of the country. The sociologists define an ethnic group as a cultural group of people based on race, language, territory, religion, customs, and beliefs who share common physical and/or social, cultural characteristics.

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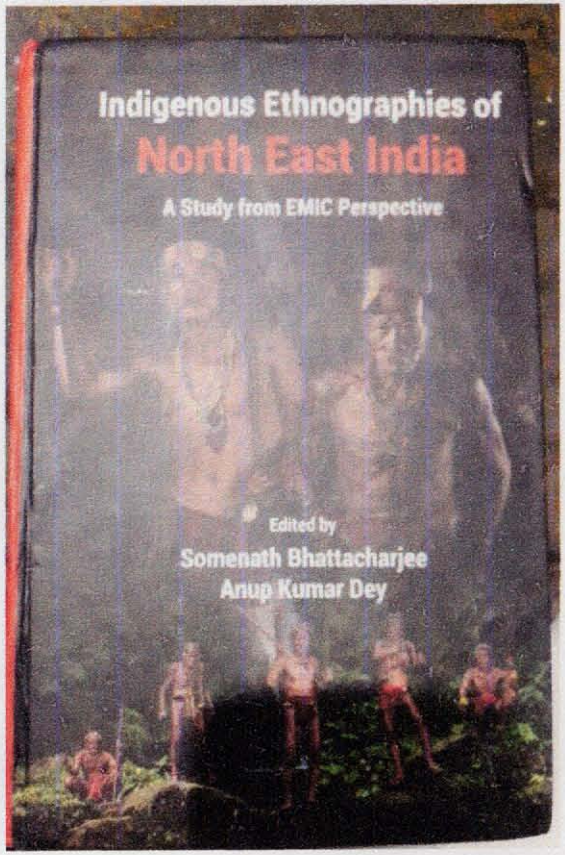
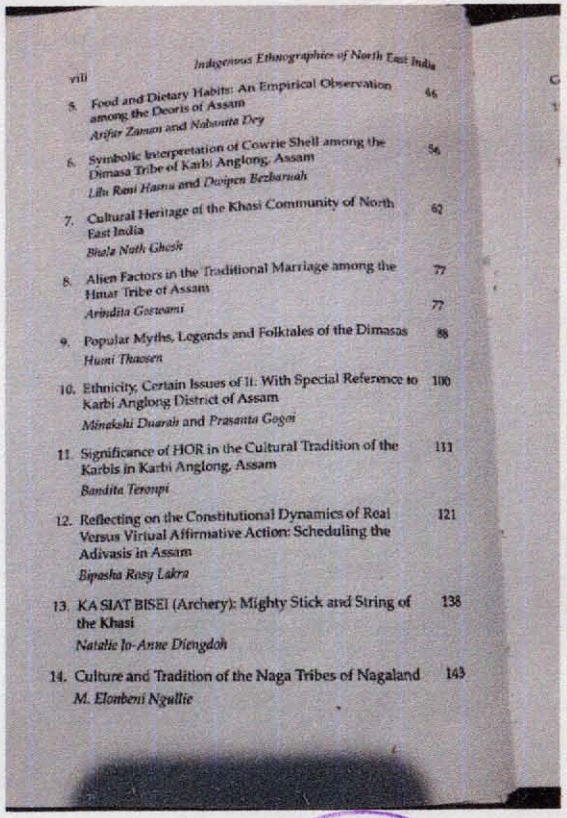
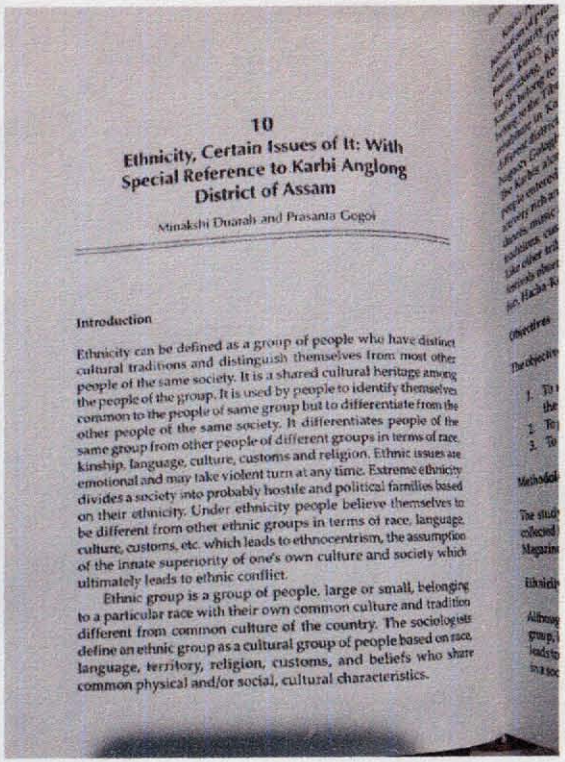




viii *Indigenous Ethnographies of North East India*



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