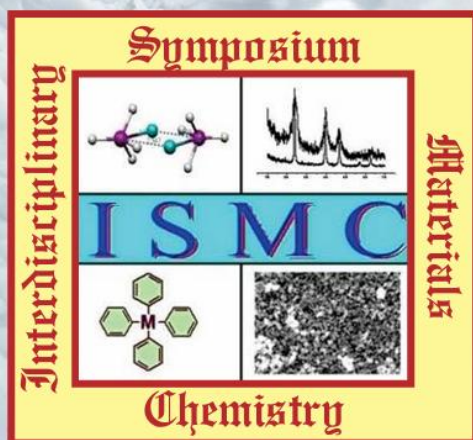


Proceedings of DAE - BRNS

8th Interdisciplinary Symposium on Materials Chemistry



June 17-19, 2021

Bhabha Atomic Research Centre
Mumbai, India

Chemistry Division
Bhabha Atomic Research Centre
Trombay, Mumbai-400 085, India
&
Society for Materials Chemistry, India

Supported by
Board of Research in Nuclear Sciences
Department of Atomic Energy
Government of India



भाभा परमाणु अनुसंधान केंद्र
BHABHA ATOMIC RESEARCH CENTRE

ISMC - 2020



ISMC – 2020

**Proceedings of
DAE-BRNS
8th Interdisciplinary Symposium on
Materials Chemistry**

Bhabha Atomic Research Centre
Mumbai, India

June 17 – 19, 2021

Organised by
**Chemistry Division
Bhabha Atomic Research Centre
Trombay, Mumbai-400 085, India
&
Society for Materials Chemistry, India**

Supported by
**Board of Research in Nuclear Sciences
Department of Atomic Energy
Government of India**

Proceedings of the eight DAE-BRNS interdisciplinary symposium on materials chemistry

Dutta, Dimple¹; Sharma, Pramod¹; Sawant, Shilpa N.¹; Barick, K.C.¹; Gupta, Vinita G.¹; Hassan, P.A. (Editor)¹; Society for Materials Chemistry, Mumbai (India) 

[Show affiliations](#)

This symposium focuses on topic related to nuclear materials, nanomaterials, carbon based materials, materials for energy conversion and storage; fuel cell materials, materials for healthcare, polymer and soft condensed matter, thin films and surface chemistry, magnetic materials, catalysis, chemical sensors, organic and organometallic compounds, high purity materials, hybrid materials and composites and computational materials chemistry. Paper relevant to INIS are indexed separately

Additional details

► Publishing Information

Publisher

Bhabha Atomic Research Centre

Imprint Place

Mumbai (India)

ISBN

978-81-953520-3-6

Imprint Pagination

456 p.

<https://inis.iaea.org/records/mmq3-as287>

1/5

4/20/25, 8:41 PM

Proceedings of the eight DAE-BRNS interdisciplinary symposium on materials chemistry

► Conference

Title

8. DAE-BRNS interdisciplinary symposium on materials chemistry

Acronym

ISMC-2020

Dates

17-19 Jun 2021

Place

Mumbai (India)

► INIS

Country of Publication

India

Country of Input or Organization

India

INIS RN

[53088981](#)

Subject category

[S37: INORGANIC, ORGANIC, PHYSICAL AND ANALYTICAL CHEMISTRY;](#)

Resource subtype / Literary indicator

Conference

Is Lead record

Yes

Table of contents

<i>M. S. no.</i>	<i>Title and Authors</i>	<i>Page no.</i>
	Keynote Address	
	Catalytic Selectivity Engineering in Valorisation of Biomass, CO ₂ and Water into Chemicals, Materials and Energy <i>Prof. G. D. Yadav</i>	1
	Invited Talks	
IT-1	2D Metal Thiolates as Single Source Precursors for the Solvent Less Preparation of Semiconducting Metal and Bimetallic Sulfide Nanocrystals <i>Bhagavatula L. V. Prasad</i>	3
IT-2	Pseudo 2-Dimensional Nanostructures: From Synthesis to Applications <i>D. Mandal, S. Biswas and Amresh Chandra</i>	5
IT-3	Enhanced Atomic Ordering Leads to Ultra-High Thermoelectric Performance <i>Kanishka Biswas</i>	7
IT-4	Hot Carrier Relaxation in CsPbBr ₃ -Based Perovskites: A Polaron Perspective <i>Hirendra N. Ghosh</i>	8
IT-5	Functionalized Supramolecular Assemblies: Platform for Unlimited Opportunities <i>A. C. Bhasikuttan</i>	9
IT-6	Development of Efficient Catalysts for Sustainable Chemical Industry <i>M. Lakshmi Kantam</i>	10
IT-7	Ionic Conductivity Pathways: A Neutron Diffraction Study <i>S. M. Yusuf</i>	11
IT-8	Multiferroic Properties and Unconventional Spin Density Wave in Doubly Ordered Perovskite NaLnNiWO ₆ (Ln=Y, Dy, Ho, and Yb) <i>A. Sundaresan</i>	12
IT-9	Molecular Architectonics: De Nova Design of Advanced Functional Materials <i>T. Govindaraju</i>	13
IT-10	Hybrid Metal-Ion Capacitors: Beyond Lithium <i>M. M. Shaijumon</i>	14
IT-11	Metal Organic Framework as a Nanosized Cavity to Stabilize the Protein Structure and Promote Catalytic Cctivity of Hybrid Myoglobin <i>Abhijit Mondal, Mriganka Das and Shyamalava Mazumdar</i>	15
IT-12	Marvels of Nanotopography on Biomedical Implants <i>Deepthy Menon</i>	16
IT-13	Soft-metamaterials: Synthesis and Characterization of Liquid Crystal-gold Nanoparticles <i>C. V. Yelamaggad</i>	17
IT-14	Electrochemical Sensors for Medical Diagnostic Application <i>Shilpa N. Sawant</i>	18
IT-15	Sensors for Monitoring Hydrogen in Sodium Systems <i>E. Prabhu, N. Murugesan, Rajesh Ganesan and V. Jayaraman</i>	19
IT-16	Establishing the Mechanism of Degradation of Ferritic/-Martensitic Steels in Lead Lithium Eutectic to be used for Fusion Energy Applications <i>Poulami Chakraborty, Raghvendra Tewari and Vivekanand Kain</i>	20
IT-17	Photofixation of Dinitrogen to Ammonia Under the Ambient Condition <i>Kulamani Parida</i>	22
IT-18	Low-cost Materials for Cleaner Energy and Environmental Applications <i>Nitin Labhasetwar</i>	24
IT-19	Elastic High Particle Content Nanocomposites by Ice-Templating <i>Karthika Suresh, Sanat Kumar, Arindam Chowdhury, Soumyajyoti Chatterjee and Guruswamy Kumaraswamy</i>	25
	Short Lectures	
SL-1	Development of Functionalized Porous Materials andtheir Catalytic Applications <i>Sk. Manirul Islam, P. Chakravorty, P. Sarkar, P.Mondal, M. Sarkar and M. Sengupta</i>	26
SL-2	Effect of Dopant Oxidation States and O-vacancies in Catalysis <i>K. Bhattacharyya</i>	27

A-161	Investigation of Phase Equilibria in SrO-La ₂ O ₃ -P ₂ O ₅ System <i>Geeta Patkare, Meera Keskar, and S. Kannan</i>	87
A-162	Thermo-physical Properties of Strontium Lanthanum Phosphates <i>Geeta Patkare, Muhammed Shafeeq, Meera Keskar, R.A. Phatak and S. Kannan</i>	88
A-163	Synthesis and Characterization of Simulated Corrosion Products for Optimisation of Decontamination Process in Boiling Water Reactors <i>V. Balaji, P. Chandramohan, Puspallata Rajesh and T.V. Krishna Mohan</i>	89
	Nanomaterials	
B-121	Copper Immobilized Polyaniline/Multiwalled Carbon Nanotube Nanocomposites for Catalytic and Antibacterial Properties <i>S. P. Deshmukh, D. K Dalavi and S. D. Delekar</i>	90
B-122	Dual Mode Behaviour of Ho ³⁺ , Yb ³⁺ and K ⁺ co-doped YVO ₄ Nanophosphor for its Optical and Hyperthermia Applications <i>Ramaswamy S. Perala, B. P. Singh, P.V. Nagendra Kumar, R. Acharya and R.S. Ningthoujam</i>	91
B-125	RGB Emission and Solar Efficiency Enhancement in Eu ³⁺ , Tb ³⁺ Activated/co-activated K ₂ NaAlF ₆ Downconversion Phosphors by Energy Transfer Mechanism <i>Abhijeet R. Kadam and S. J. Dhoble</i>	92
B-126	Synthesis, Characterization and Biological Applications of Pure and Bio - modified TiO ₂ Nanoparticles <i>P. Maheswari, S. Ponnusamy, S. Harish, M. Navaneethan, K. D. Nisha, Ganesh Munuswamy Ramanujam and Y. Hayakawa</i>	93
B-127	Hypoxia Responsive Nanoparticle Conjugates for Anticancer Drug Delivery <i>Rashmi Kumari, Vasumathy R, Dhanya Sunil, Raghmani Singh Ningthoujam, Srinivas Mutalik and Badri Narain Pandey</i>	94
B-128	Influence of Laser Polarization on Dynamics of Gas-Phase Nanoclusters: A Case Study on (CCl ₄) _n Clusters <i>P. Sharma and S. Das</i>	95
B-129	Structural and Solid-State Properties of Mn Substituted Ni-Zn Ferrites Synthesized by Combustion Method <i>Seneca O. Costa and V.M.S. Verenkar</i>	96
B-130	Biogenic synthesis of ZnO nanoparticles using <i>Annonamuricata</i> plant leaf extract and its anti-cancer efficacy on 2D and 3D tumor models <i>Siva Chander Chabattula, Piyush Kumar Gupta, Rama Shanker Verma, Debashis Chakraborty</i>	98
B-131	Combustion Triggered Route for Synthesizing Nanostructured Nickel Substituted Cobalt Ferrites: Investigations on their Structural, Morphological, Electrical, Dielectric and Magnetic Properties <i>Mangala U. Sawal and V. M. S. Verenkar</i>	99
B-132	Study of Interaction of a Coagulating Agent Protamine Sulfate with Lipid Bio-Membrane <i>Ripa Paul, Surajit Sarkar, Hritinava Banik, Debajyoti Bhattacharjee, Syed Arshad Hussain</i>	100
B-133	Comparative Studies of Electrical Properties of Tin Doped BaTiO ₃ Synthesized Via Two Different Low Temperature Routes <i>Richa Tomar, Karan Surana, Pankaj Gupta and N. B. Singh</i>	101
B-134	X-Ray Diffraction Analysis of Hexagonal Klockmannite Nanoparticles and its UV Photodetection Property <i>Kunjal Patel, Anand Patel and Vibhuti P. Jethwa</i>	102
B-135	Polymeric Scaffold of Gallic Acid Loaded Chitosan Nanoparticles Infused With Collagen-Fibrin for Wound Dressing Application <i>Pallavi Shyam Kaparekar, Srinivetha Pathmanapan^a and Suresh Kumar Anandasadagopan</i>	103
B-136	Cyclic Voltammetry Performance of La-doped SrTiO ₃ Electrodes for Supercapacitor Applications <i>V. V. Deshmukh, H. P. Nagaswarupa, C. R. Ravikumar, and N. Raghvendra</i>	104
B-137	Tailoring Electronic and Optical Properties of Graphene Quantum Dots by Heteroatom Nitrogen Doping <i>Tushima Basak and Tista Basak</i>	105
B-138	Use of Single Source Precursor for the Synthesis of Wurtzite Form of ZnS <i>Nisha Kushwah, A. Wadawale, G. Kedarnath, V. Sudarsan and R. M. Kadam</i>	106

Combustion Triggered Route for Synthesizing Nanostructured Nickel Substituted Cobalt Ferrites: Investigations on their Structural, Morphological, Electrical, Dielectric and Magnetic Properties

Mangala U. Sawal and V. M. S. Verenkar*

School of Chemical Sciences, Goa University, India

*E-mail: vmsv@unigoa.ac.in; Contact no. : +91- 9822980123

Nanomaterials are found to show interesting properties in the past few decades. One among such promising nanomaterials is nano spinel ferrites which have amazing structural, electrical, dielectric and magnetic properties which fascinates researchers. Our proposed research work deals with the synthesis of the 'as prepared' nickel substituted cobalt ferrites, $\text{Ni}_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$ where $x=0.1(\text{N1})$, $0.3(\text{N3})$ and $0.5(\text{N5})$ by combustion method employing tartaric acid as a fuel. The XRD pattern of the 'as prepared' ferrites showed formation of monophasic cubic spinel structure (Fig. 1a). There is a decrease in the lattice parameter with an increase in the nickel concentration [1]. The IR spectra depict two characteristic absorption peaks of spinel at around 600 cm^{-1} and 400 cm^{-1} [2]. The SEM micrographs show nearly spherical nano-sized particles, which are largely agglomerated. The EDAX spectra confirmed the presence of desired metal ions on the surface of the ferrites without any impurity peak.

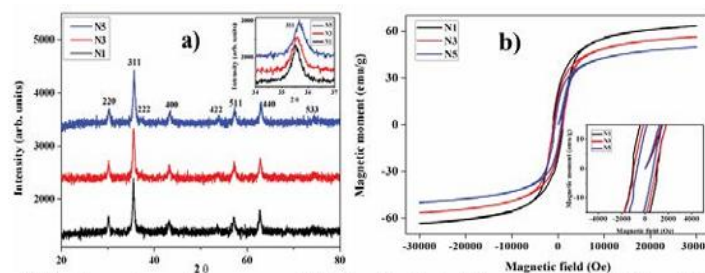


Figure 1. a) X-Ray diffraction pattern of 'as prepared' $\text{Ni}_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$ ($x=0.1, 0.3, 0.5$) and b) The VSM plots of magnetic moment against magnetic field at room temperature of 'as prepared' $\text{Ni}_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$ ($x=0.1, 0.3, 0.5$)

The electrical property measurements indicate a decrease in resistivity with increase in temperature [3], and also decrease with an increase in the cobalt content [4]. The variation of dielectric properties as a function of frequency shows high values at lower frequencies which decreases with increase in frequency and remains constant at high frequencies [5]. The Curie temperature determined from A.C. susceptibility measurements found to increase with increase in nickel content [1]. The VSM plots of all the ferrites indicate ferromagnetic nature (Fig. 1b) and show a decrease in saturation magnetization (M_s) with increase in the nickel content [4] in Ni-Co ferrites.

References:

1. M. Mozaffari, J. Amighian and E. Darsheshdar, *J. Magn. Magn. Mater.*, 350 (2014) 19.
2. A. Baykal, N. Kasapoğlu, Y. Köseoğlu, A. C. Başaran, H. Kavas and M. S. Toprak, *Cent. Eur. J. Chem.*, 6 (2008) 125.
3. Daniel M. Coutinho and V. M. S. Verenkar, *J. Therm. Anal. Calorim.*, 128 (2017) 807.
4. R. C. Kambale, P. A. Shaikh, S. S. Kamble and Y. D. Kolekar, *J. Alloys Comp.*, 478 (2009) 599.
5. P. P. G. Dessai, S. S. Meena and V.M.S. Verenkar, *J. Alloys Compd.*, 842 (2020) 155855.