

Kusum Lata Pandey
Pradip Kumar Priya
Umesh Kumar Yadav
Prashanta Kumar Khandai *Editors*

Proceedings of the National Workshop on Recent Advances in Condensed Matter and High Energy Physics

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Editors

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Chapter 6

Theoretical Approach to Modify the Born–Mayer Parameters in Layered Superconductor



Hempal Singh

Abstract Since 1932, most of the scientists considered the coefficients (known as range and softening constants) of Born–Mayer potential as constants need in depth investigation. This has been explored in the form of Born–Mayer–Huggins (BMH) potential for the high temperature superconductors in a new frame work which enables to develop the expressions for Born–Mayer parameters, bulk modulus, and pressure. These investigations divulge that the Born–Mayer parameters for different interactions in high temperature superconductor are not simple quantities but depend upon various physical quantities like pressure, charges, volume, and Gruneisen parameter which is the measure of the strength of anharmonic affects in high temperature superconductors. The numerical computations have been performed for the various interactions of $\text{YBa}_2\text{Cu}_3\text{O}_{6+\delta}$ (*YBCO*) superconductor to adjudge the suitability of this formalism which is applicable to other high temperature and layered superconductors.

6.1 Introduction

The Ba–La–Cu–O was the first high temperature superconductor (HTS) with critical temperature 35 K stands as a landmark discovery by Bednorz and Muller in 1986 [1]. The fascinating area of high temperature superconductivity (HTSC) attracted the attention of scientific community which not only led to synthesize the HTSC at room temperature but also to investigate its various dynamical properties. Owing to the established that the HTS has layered structures with large number of atoms per unit cell, the requirement of a suitable potential becomes mandatory to study the various dynamical properties of layered systems. A newly developed Born–Mayer–Huggins (BMH) potential has been proposed to study the lattice spectrum of YBCO which is a combination of attractive and repulsive interactions and can be represented as [2–8]

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Writer in Context

INDIRA GOSWAMI

MARGINS AND BEYOND

Edited by
Namrata Pathak and Dibyajyoti Sarma



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The Divine and the Mundane

Ritual Sacrifice, Blood and the Feminine Principle in
Indira Goswami's *Under the Shadow of Kamakhya*
and *The Man from Chinnamasta*

Vibha S Chauhan

I

Indira Goswami uses her pen to represent not just different socio-economic and religious aspects of Assam but that of many other regions as well. Some of her most poignant writings focus on the issues of marriage and widowhood. Her early novel *The Blue-Necked Braja* (1976) tells the unfortunate story of deprivations that the widows in the holy city of Vrindavan are forced to live through. Religion and religious ritualism become a façade for sexual and emotional exploitation of the widows. The theme is revisited in *The Moth-Eaten Howdah of a Tuskar* (2004), in which Indira Goswami unveils the distressing conditions of widows living in a religious institution, the Vaishnavite Satra.¹ This integration of the 'woman question' with religion once again becomes the core theme of Goswami's novel, *The Man from Chinnamasta* (Chinnamasta 2006) and her story, *Under the Shadow of Kamakhya* (Kamakhya 2001). *Kamakhya* is one of the eight stories in the collection with the same title. It is the longest story in the collection and is often referred to as a novella due to not just its length but also the complex construction, deconstruction and the reconstruction of different layers of experience it portrays in domestic and religious spheres. In *Chinnamasta*, Goswami examines and analyses the ancient religious tradition of animal sacrifice at the Kamakhya temple situated in the city of Guwahati in Assam. The novel, when it was published, generated a grave controversy and an uproar across many orthodox sections of society that considered the book to be an attack on ancient religious rituals and practices. However, both the book and the writer also received unprecedented support from the general masses as well as animal rights groups that demanded the banning of animal sacrifice at the Kamakhya temple. The novel thus blurs the distinction between 'fact' and 'fiction', which is any case, as Terry Eagleton says, is

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Chapter 16

Morse Potential in Y-123 High Temperature Layered Superconductors



Hempal Singh

Abstract Adopting the Morse (combination of short-range repulsive and long-range attractive) potential, the stability, nature, and ranges of interactions for representative high temperature cuprate superconductor $\text{YBa}_2\text{Cu}_3\text{O}_{6+\delta}$ (Y-123) have been investigated. The study of various interactions in Y-123, like Y–O, Y–Ba, and Y–Cu, has been incorporated as a function of inter-atomic distance. The results resemble with the earlier findings with deeper insight of short- and long-range interactions in the layered systems. This work is applicable to all the layered and high temperature superconductors.

16.1 Introduction

The advent of new era of high temperature superconductivity (HTSC) begun with the breakthrough discovery of first high temperature superconductor (HTS) ceramics Ba–La–Cu–O in 1986 by Bednorz and Muller [1]. These cuprate HTS are known for their layered structures with large number of atoms per unit cell, which mandatorily enforces the requirement of a suitable potential to study various dynamical properties of such systems. Many physicists attempted to describe various properties of layered superconductors adopting different types of potentials like Morse potential (MP) [2–4], Lennard–Jones potential [5, 6], Mie potential [7], and Born–Mayer–Huggins potential (BMH) [8]. Of these various potential, the present work deals analytically with the details and suitability of Morse potential in a new framework taking the case of Y-123 HTS with a comparison with Born–Mayer–Huggins potential.

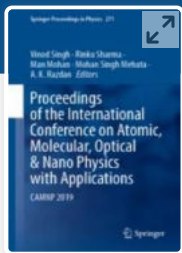
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Structural, Magnetic and Optical Study of Transition Element Doped Bismuth Ferrite

Arti [Anahat](#), [Sumit Kumar](#), [P. Kumar](#) & [Vivek Verma](#)

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Abstract

Enhanced structural and optical properties of pure and manganese (Mn) doped bismuth ferrite has been studied using sol–gel method as preparation technique. The scanning electron microscope analysis showed that Mn doping decreases grain size. M-H loops shows modified magnetic properties with Mn doping. The values of dielectric constants $\epsilon' = 63.68$ and $\epsilon'' = 12.47$ of BFO are seen to be enhanced with increase in manganese content and is maximum for $\text{BiFe}_{0.8}\text{Mn}_{0.2}\text{O}_3$ sample. The observed behaviour of ferroelectric P-E loops shows modification with increase in manganese content in BFO samples. The modified ferroelectric

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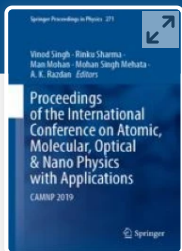
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Safe, Efficient and Portable Power Generation in Oxide Based Hydroelectric Cells by Water Splitting

[Parveen Kumar](#), [Sumit Kumar](#), [Arti](#) & [Vivek Verma](#)

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Abstract

Hydroelectric cell is a new green source of energy which uses only water for electricity generation without any harmful effects to the environment. Lithium doped magnesium ferrites and tin oxide samples were prepared by solid state sintering method for the green energy production. The XRD pattern of the magnesium lithium ferrite (MLFO) sample confirmed the spinel phase formation and for the SnO₂ sample, the pattern exhibited tetragonal structure without any impurity. Surface morphology of MLFO and SnO₂ sample was observed by using Scanning Electron Microscopy (SEM) which confirmed the porous nature of the

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