

ACADEMICIA

ISSN (online) : 2249-7137

ACADEMICIA

An International  
Multidisciplinary Research  
Journal



Published by

**South Asian Academic Research Journals**

A Publication of CDL College of Education, Jagadhri

(Affiliated to Kurukshetra University, Kurukshetra, India)



# ACADEMICIA

## An International Multidisciplinary Research Journal

(Double Blind Refereed & Peer Reviewed International Journal)



SR. NO.	PARTICULAR	PAGE NO.	DOI NUMBER
1.	ASSESSMENT OF TRAINING METHODS AND TECHNIQUES IN GOVERNMENT CRAFT DEVELOPMENT CENTRES IN RIVERS STATE, NIGERIA : A CASE STUDY OF GOVERNMENT CRAFT DEVELOPMENT CENTRE, PORT HARCOURT RIVERS STATE, NIGERIA Suobere T. Puyate, Iheanyi N. Okwakpam	24-37	10.5958/2249-7137.2021.00061.6
2.	SUPPORTING INNOVATIVE APPROACHES IN THE EDUCATION SYSTEM Axmedov M. M, Hojlikarimova G.T, Boybabayev R.H, Safarova G.M	38-41	10.5958/2249-7137.2021.00001.X
3.	FROM THE HISTORY OF FOREIGN RELATIONS OF UZBEK THEATERS IN THE YEARS OF INDEPENDENCE Chorieva Dilorom Abdumuminovna	42-46	10.5958/2249-7137.2021.00002.1
4.	SEMANTIC-COGNITIVE INTERPRETATION OF WORDS EXPRESSING THE CONCEPT OF "STRANGER" (ON THE BASIS OF ENGLISH AND UZBEK LANGUAGES) Ismailov Turgun Salaxiddinovich	47-50	10.5958/2249-7137.2021.00012.4
5.	UNDERSTANDING COMPOSITION THROUGH WORK ANALYSIS Bobomurodov Ziyodullo Rustamovich, Akhmedov Mukhommod-Umar Bakhriiddinovich, Khasanova Munisa	51-55	10.5958/2249-7137.2021.00013.6
6.	EQUIPPING HIGHWAYS (ON THE EXAMPLE OF THE KUNGRAD-MUYNAK HIGHWAY) Khotamov Asadulla Toshtemirovich, Abdikhalilov Fitrat Abdikhalil oglu, Rashidov Sardor Ulugbek oglu	56-61	10.5958/2249-7137.2021.00014.8
7.	DISCOURSES ON THE USAGE OF MEDICINAL PLANTS AND THEIR PROTECTION Sirojiddin Ahmatovich Murodov, Husniddin Kurbonovich Esanov	62-66	10.5958/2249-7137.2021.00022.7
8.	BLOOD PRESSURE DYNAMICS Z.T.Safarova	67-70	10.5958/2249-7137.2021.00023.9
9.	SPECIAL PROPERTIES OF HYDROGEN Ashirov Vosit Rahmatulloevich, Usanov Abdulkhakim Eshankulovich, Kholiyorov Shukhrat	71-75	10.5958/2249-7137.2021.00019.7
10.	SEBACEOUS CELL CARCINOMA OF EYELID: A RARE PRESENTATION Dr. Neeraj Kumar Rathee, Dr. Awadhesh Kumar Pandey, Mr. Suraj, Dr. Hari Krishan Rathee	76-78	10.5958/2249-7137.2021.00060.4

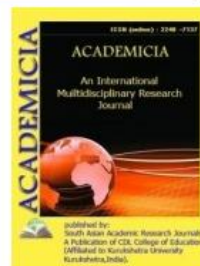
185.	MODULATED MAGNETIC STRUCTURES AND MODELS OF THEIR THEORETICAL EXPRESSION Yuldasheva Nilufar Bakhtiyorovna, Fayziev Shakhobiddin Shavkatovich	1172-1175	10.5958/2249-7137.2021.00174.9
186.	HYPNOSIS IN THE THERAPY OF SEXUAL DISORDERS IN UZBEKISTAN Sakellion D.N, Irgashev D.S, Alimov U.Kh, Sultanov Sh.Kh	1176-1183	10.5958/2249-7137.2021.00173.7
187.	THE ARTISTIC INTERPRETATION OF THE IMAGE OF THE "REBEL WOMAN" IN THE WORKS OF GEORGE SAND Alikulova Dildora Bakir kizi	1184-1187	10.5958/2249-7137.2021.00172.5
188.	INTEGRATED LEARNING CONCEPT Gofirov Muzaffar Jumaevich	1188-1191	10.5958/2249-7137.2021.00171.3
189.	USE OF MINERALIZED WATER FOR EFFECTIVE COTTON IRRIGATION Shadmanov Jamoliddin Kazakjanovich, Marufkhanov Khusankhuja Muratovich	1192-1195	10.5958/2249-7137.2021.00200.7
190.	STUDY OF PEREONIMES IN THE UZBEK LANGUAGE Sidikova Nozgul Nabiyevna	1196-1198	10.5958/2249-7137.2021.00199.3
191.	TEACHING BASED ON DISTANCE EDUCATION TECHNOLOGY AS A COMPLETE PEDAGOGICAL PROBLEM Karimov Komiljon Abduraximovich	1199-1203	10.5958/2249-7137.2021.00198.1
192.	PSYCHOLOGICAL AND PEDAGOGICAL ASPECTS OF TEACHING STUDENTS Adilova Dilorom Kadirovna	1204-1207	10.5958/2249-7137.2021.00197.X
193.	PSYCHOLOGICAL ASPECTS OF DETERMINING THE CHILD'S READY FOR THE EDUCATIONAL PROCESS Melieva Yayra	1208-1211	10.5958/2249-7137.2021.00196.8
194.	FOREIGN DIRECT INVESTMENT AND ITS IMPACT ON MACROECONOMIC VARIABLES, INVESTMENT POLICY IN FRANCE: IMPLEMENTING INVESTMENT FRAMEWORK OF FRANCE IN UZBEKISTAN Nozim Muminov, Jakhongir Tursunov, Zilola Urozalieva, Marufjon Nematjonov	1212-1220	10.5958/2249-7137.2021.00195.6
195.	METHODS OF DEVELOPMENT TOLERANCE SKILLS PUPILS IN PRIMARY SCHOOL Gafurova Nodira Ravshanovna	1221-1224	10.5958/2249-7137.2021.00194.4
196.	TELEVISION ADVERTISEMENTS AND CHILDREN'S BEHAVIOR: PARENTS' EXPERIENCE BASE STUDY IN THE POST-WAR CONTEXT Dilogini.K, Shivany.S	1225-1241	10.5958/2249-7137.2021.00260.3
197.	COMPARATIVE ANALYSIS OF SUFFIXES OF POSSESSIVE CASE IN JAPANESE AND UZBEK LANGUAGES Sitorabonu Farxodovna Malikova	1242-1250	10.5958/2249-7137.2021.00116.6
198.	THE STUDY OF TRANSIENT PROCESSES TAKING PLACE IN CURRENT TRANSFORMERS Sultan Fayzullayevich Amirov, Shavkat Mukhsimov	1251-1260	10.5958/2249-7137.2021.00115.4



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## An International Multidisciplinary Research Journal

(Double Blind Refereed & Peer Reviewed Journal)



DOI: **10.5958/2249-7137.2021.00174.9**

### MODULATED MAGNETIC STRUCTURES AND MODELS OF THEIR THEORETICAL EXPRESSION

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#### ABSTRACT

*This paper is devoted to study of physical processes occurring in weak ferromagnetics iron - borate doped diamagnetic magnesium under external influence. The ideas of phase transitions are not only successfully applied in various fields of modern physics, but also in biology, chemistry, geology, and even economics and other social sciences. Thus, the article presents the results of the study of changes in the magnetic properties of iron borate when a magnesium mixture is added and the properties of this change as a result of external influences (temperature, mechanical impact, magnetic field and light).*

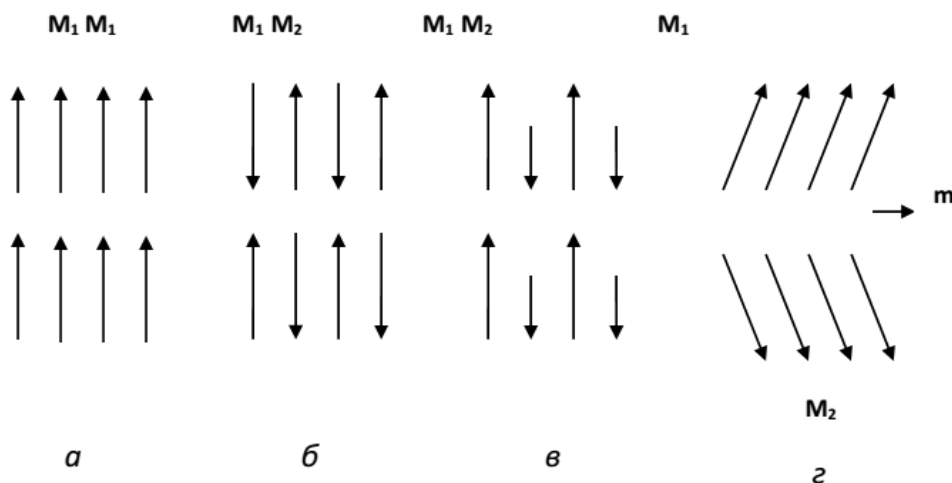
**KEYWORDS:** *Modulated Magnetic Structure, Linear Magnetic To Refracting Rays Domain Structure.*

#### INTRODUCTION

In today's world, where the division of physics into many disciplines is taking place, the ideas and ideas that generalize the different branches of physics play an important role. Such synthesizing assumptions can lead to scientific ideas related to phase transitions. The ideas of phase transitions are not only successfully applied in various fields of modern physics, but also in biology, chemistry, geology, and even economics and other social sciences. Phase transitions are the subject of traditional research in condensed matter physics, and magnetically ordered crystals are known to be the classic object of this research.

Picture 1. Magnetic arrangement of crystals: a - ferromagnetism, b - antiferromagnetism, c - ferrimagnetism, g - weak ferromagnetism (**M1**, **M2** - magnetic moments of neighboring atoms;

$m$  - weak ferromagnetic moment). is devoted to the study of changes in physical processes that occur as a result of external influences.



Iron borate is a green, transparent, optically anisotropic crystal in the spectral field of view. Below the Neel temperature,  $\text{FeBO}_3$  remains an optical two-axis, one of the optical axes coinciding with the symmetry head axis ( $C_3$  axis) [3]. At room temperature, the maximum absorption spectra of iron borate in the light spectrum are 0.62 and 0.88  $\mu\text{m}$ , and the value of the absorption coefficient is a  $\sim 50 \text{ cm}^{-1}$  [4,5]. These two maxima in the absorption spectrum correspond to the separated states of  $\text{Fe}^{3+}$  ions in the crystal field. They can be associated with transitions between cases  ${}^4T_2$  ( ${}^4G$ ) and  ${}^4T_1$  ( ${}^4G$ ), which are excited from the ground state, i.e.,  ${}^6A_1$  ( ${}^6S$ ), respectively [1,2].

The study of the magneto-optical properties of this crystal is carried out in the field of transparency, i.e. mainly using the Faraday effect and magnetic linear dichroism methods [2,5]. The value of these effects is in the same order when light is scattered near the crystal optical axis (increases by 1.7 times when cooled to  $\sim 10^{-3}$ , 77 K at  $T = 300$  K). Magnetic binary refraction (MBR) in the  $\text{FeBO}_3$  crystal has been studied in the field of transparency of the crystal, i.e., in the field with a wavelength  $\lambda \sim 0.5 \mu\text{m}$  [1]. The value of MBR was the difference in refractive indices of the specific modes of the crystal when the temperature  $T = 77$  K was  $\approx 2 \times 10^{-5}$ .

When a small amount of diamagnetic compounds was added to the iron borate, a change in its magneto-optical properties was observed without changing the Neel temperature [4].

**CONCLUSION:** Thus, the article presents the results of the study of changes in the magnetic properties of iron borate when a magnesium mixture is added and the properties of this change as a result of external influences (temperature, mechanical impact, magnetic field and light). This means that when the crystal is exposed to light, the displacement of  $\text{Fe}^{4+}$  ions is metastable, and when light is received, the  $\text{Fe}^{4+}$  ions return to their initial state over a period of time, i.e. the photoinduced changes in the magnetic parameters of the crystal "dissipate" in the absence of additional illumination. Similar photomagnetic phenomena can be observed in the  $\text{FeBO}_3$ : Mg crystal.

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