Mohamad Mahmoud Ahmad

Associate Professor – Department of Physics

King Faisal University, Saudi Arabia

& Assiut University, Egypt

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Full Name: Mohamad Mahmoud Ahmad Mohamad

Current Position (Since 2009)

Associate Professor, Department of Physics, College of Science, King Faisal University, Al-Ahsaa, Saudi Arabia

Permanent Position:

Associate Professor, Physics Department, Faculty of Science, Assiut University, The New Valley Branch, El-Kharga, Egypt.

Date of Birth: March, 27, 1972

Place of Birth: Assiut, Egypt

Gender: Male

Contact Information:

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Educational Background

1- Ph.D (Experimental Solid State Physics), Department of Physics, Faculty of Science, Assiut University (joint program with Hiroshima University, Japan), February 2004.

Thesis Title: "Ion Dynamics and relaxation in Fluoride Ion Conductors $PbSnF_4$, KSn_2F_5, and $RbSn_2F_5$ Studied by NMR and Impedance Spectroscopy"

2- M.Sc. Degree, Physics, Department of Physics, Faculty of Science, Assiut University, Egypt, September 1999.

Thesis Title: "Spectroscopic Studies and Electrical Conductivity Behavior of γ-Irradiated Li_2SO_4-K_2SO_4, Li_2SO_4-Na_2SO_4 and K_2SO_4-Na_2SO_4 Mixed Systems"

3- B.Sc. Degree, Department of Physics, Faculty of Science, Assiut University, Egypt, June 1994.

Careers

1995-1999: Instructor of Physics, Faculty of Education, Assiut University, The New Valley Branch, El-Kharga, Egypt.

1999-2004: Assistant Lecturer, Faculty of Education, Assiut University, The New Valley Branch, El-Kharga, Egypt.

2001-2003: Guest Researcher, Department of Chemistry, Graduate School of Science, Hiroshima University, Japan. An Egyptian government funded scholarship to perform the experimental part of the Ph.D studies.

2004-2009: Assistant Professor of Physics, Faculty of Education, Assiut University, The New Valley Branch, El-Kharga, Egypt.

2006-2008: JSPS "Japan Society for the Promotion of Science" postdoctoral Fellow, at the Inorganic Materials Chemistry Lab of Prof. Koji Yamada, Department of Applied Molecular Chemistry, Nihon University, Narashino, Chiba, Japan.

2008-2009: Contract Researcher, Condensed Molecular Materials Group of Prof. Reizo Kato, RIKEN, Wako, Saitama, Japan.

2009 to date: Associate Professor of Physics, Faculty of Science, Assiut University, The New Valley Branch, El-Kharga, Egypt.

2009 to date: Associate Professor of Physics, College of Science, King Faisal University, Al-Al-Ahsaa, Saudi Arabia.

Research Interests

Topics:

1- Solid lithium and oxygen ion conductors for energy storage and energy conversion applications.

2- Micro-/Nano-ceramics of oxide materials with giant dielectric properties

3- Ionic conduction and relaxation dynamics in ionic conducting materials.

4- Dielectric properties and dielectric relaxation phenomena in solid materials.

5- Mechanochemical synthesis of nanocrystalline materials.

6- Spark plasma sintering of micro-/nano-ceramics.

Techniques:

Main techniques include: mechanochemical synthesis and solid state reaction for the preparation of materials, conventional and spark plasma sintering of different dielectric/ionic conducting materials, XRD and SEM for materials characterization, impedance spectroscopy over wide ranges of frequencies and temperatures for the study of the transport and dielectric properties.

Awards

1- The Egypt State Award of Physical Sciences 2007. Awarded by the Academy of Scientific Research and Technology, Egypt.

2- JSPS postdoctoral fellowship 2006-2008 at Nihon University, Japan. Awarded by the Japan Society for the Promotion of Science.

3- Guest Researcher 2001-2003 at Hiroshima University, Japan. A scholarship awarded by the Ministry of Higher Education, Egypt.

Former Memberships at Scientific Societies:

1- The Physical Society of Japan

2- The Chemical Society of Japan

Other Scientific Activities:

Reviewer for the following international journals:

Electrochemica Acta, Physical Chemistry Chemical Physics, Journal of Physical Chemistry C, Journal of Applied Physics, Solid State Ionics, Solid State Sciences, Materials Chemistry and Physics, Journal of Materials Science: Materials in Electronics, Physica B, Ionics, Chemical Physics Letters.

Funded Projects

(a) As a Principal Investigator:

1- Giant Dielectric Constant in Doped NiO Nanoceramics Prepared by Non-Conventional Mechanochemical Synthesis and Spark Plasma Sintering Techniques (NSTIP Project, King Abdul-Aziz City for Science and Technology, KACST, Saudi Arabia. Budget of 2,000,000 SR. Status: running).

2- New strategy for the optimization of the ionic conduction in glass–insulator composite materials (NSTIP Project, King Abdul-Aziz City for Science and Technology, KACST, Saudi Arabia. Budget of 2,000,000 SR. Status: running).

3- Optimization of the Oxide Ion Conductivities in Apatite Lanthanum Silicates/Germanates Nano-Ceramics (NSTIP Project, King Abdul-Aziz City for Science and Technology, KACST, Saudi Arabia. Budget of 2,000,000 SR. Status: accepted).

4- Development of lithium ion batteries based on nanocrystalline lithium garnet materials (KACST Annual Projects, Saudi Arabia. Budget of 593,000 SR. Status: finished).

5- Effect of Ba and Y double substitution and spark plasma sintering on the ionic conductivity of $Li_{5+x+2z}La_{3-x}Ba_xTa_{2-z}Y_zO_{12}$ lithium ion conductors (Deanship of Scientific Research, King Faisal University, Saudi Arabia. Budget of 69,400 SR. Status: running).

6- Advanced nanoceramics for application in intermediate temperature solid oxide fuel cells (Deanship of Scientific Research, King Faisal University, Saudi Arabia. Budget of 130,000 SR. Status: running).

7- One-Step Mechanochemical synthesis and Enhanced Ionic Conductivity of AgX-Al_2O_3 (X = I, Br) Nanocomposite materials (Deanship of Scientific Research, King Faisal University, Saudi Arabia. Budget of ~ 100,000 SR. Status: finished).

8- Giant Dielectric Properties in Nanocrystalline $M_{1-x}Sn_xF_2$ (M = Pb, Ba) Solid Solutions (Deanship of Scientific Research, King Faisal University. Budget of 99,400 SR. Status: finished).

(b) <u>As a Co-PI:</u>

9- Effects of Bi_2O_3 addition in micro and nano scale on the structural and electrical properties of $Zn_{1-x}Bi_xO$ varistors (Deanship of Scientific Research, King Faisal University. Budget of 79,000 SR. Status: finished).

10- Nano-ceramics of $La_{0.5}Na_{0.5}Cu_3Ti_4O_{12}$ by Mechanochemical Milling and sub-sequent Spark Plasma Sintering for Charge Storage Applications (Deanship of Scientific Research, King Faisal University. Budget of 90,000 SR. Status: running).

Teaching Activities

- Between 1995 – 2001 I worked as an administrator and assistant lecturer at Assiut University, Egypt, where my main job (besides my research for the master and Ph.D degree) was to teach physics lab experiments at different levels for undergraduate students
- Between 2004 – 2006 at Assiut University, Egypt and from 2009 up to now at King Faisal University, Saudi Arabia I have taught different courses of physics including:

  General physics I, general physics II, general physics III, properties of matter, electricity and magnetism, dc and ac circuits, geometrical optics, waves, modern physics, solid state physics, physics labs.

Supervision of Master Students

Currently I am the senior supervisor of four master students:

1- Eman Al-Libidi

Giant dielectric constant and transport properties of fine-grained metal oxide ceramics

2- Munirah Al-Quaimi

Enhancement of the lithium ionic conductivity and study of the conduction mechanism in $Li_5La_3Nb_2O_{12}$ garnets doped with Gd^{+3} and Sm^{+3}

3- Fatimah Al-Ghareeb

Ionic conduction and relaxation properties of conventionally and spark plasma sintered $Li_{5+2x}La_3Ta_{2-x}Ga_xO_{12}$ lithium conducting garnets

4- Latifah Al-Simaiel

Effect of composition and grain size on the transport and dielectric properties of $BaTi_{1-x}Zr_xO_3$ ceramics

Administrative responsibilities

I have participated effectively in different administrative duties in the department, the college and the university such as

1- Committee member of the science and technology unit of King Faisal University.

2- Representative of physics department in the committee of academic affairs of college of science.

3- Responsible for preparing courses time tables of the faculty members of physics department.

List of Publications

(a) Book Chapters:

1- **Mohamad M Ahmad**, "Conductivity and dielectric relaxations in ionically conducting crystals", in '***Focus on Condensed Matter Physics Research***', edited by John V. Chang (Nova Science Publishers, Inc., New York), Chapter 3, (2005).

(b) Journal Papers:

40- **M.M. Ahmad***, F.R. Al-Ghareeb and K. yamada

"Effect of Ga^{+3} substitutions on the ionic conduction, dielectric and relaxation properties of $Li_{5+2x}La_3Ta_{2-x}Ga_xO_{12}$ lithium conducting garnets", **Journal of the Electrochemical Society, under review** (2016).

39- **M.M. Ahmad*** and H.M. Kotb

"Giant dielectric properties of fine-grained $Na_{1/2}Y_{1/2}Cu_3Ti_4O_{12}$ ceramics prepared by mechanosynthesis and spark plasma sintering", **Journal of Materials Science: Materials in Electronics, Vol. 26,** 8939 (2015).

38- **M.M. Ahmad*** and A. Al-Jaafari

"Concentration and mobility of mobile Li^+ ions in $Li_6BaLa_2Ta_2O_{12}$ and $Li_5La_3Ta_2O_{12}$ garnet lithium ion conductors", **Journal of Materials Science: Materials in Electronics**, **Vol. 26**, 8136 (2015).

37- **M.M. Ahmad*** and M.M. Al-Quaimi

"Origin of the enhanced Li^+ ionic conductivity in Gd^{+3} substituted $Li_{5+2x}La_3Nb_{2-x}Gd_xO_{12}$ lithium conducting garnets", **Physical Chemistry Chemical Physics**, Vol. **17**, 16007 (2015).

36- **Mohamad M. Ahmad***

"Estimation of the concentration and mobility of mobile Li^+ ions in the cubic garnet-type $Li_7La_3Zr_2O_{12}$", **RSC Advances,** Vol. **5,** 25824 (2015).

35- **Mohamad M. Ahmad***

"Lithium ionic conduction and relaxation dynamics of spark plasma sintered $Li_5La_3Ta_2O_{12}$ garnet nanoceramics", **Nanoscale Research Letters,** Vol. **10**, 58 (2015).

34- **Mohamad M. Ahmad***

"Enhanced lithium ionic conductivity and study of the relaxation and giant dielectric properties of spark plasma sintered $Li_5La_3Nb_2O_{12}$ nanomaterials", **Ceramics International,** Vol. **41**, 6398 (2015).

33- **Mohamad M. Ahmad***

"One-Step Mechanochemical synthesis and Enhanced Ionic Conductivity of AgI-Al_2O_3 composite materials", **Zeitschrift fuer Naturforschung A,** Vol. **70,** 17 (2015).

32- **Mohamad M. Ahmad***

"Giant dielectric properties of nanocrystalline Pb1-xSnxF2 solid solutions", **Journal of Materials Science: Materials in Electronics,** Vol. **25**, 4398 (2014).

31- **M.M. Ahmad*** and K. Yamada

"Grain size effect on the giant dielectric constant of $CaCu_3Ti_4O_{12}$ nanoceramics prepared by mechanosynthesis and spark plasma sintering", **Journal of Applied Physics 115,** 154103 (2014).

30- **M.M. Ahmad,** E. Al-Libidi, A. Al-Jaafari, S. Ghazanfar and K. Yamada

"Mechanochemical synthesis and giant dielectric properties of $CaCu_3Ti_4O_{12}$", **Applied Physics A 116,** 1299 (2014)

29- **Mohamad M. Ahmad***

"Giant dielectric constant in $CaCu_3Ti_4O_{12}$ nanoceramics", **Applied Physics Letters 102**, 232908 (2013).

28- **M.M. Ahmad***, Y. Yamane, and K. Yamada

"The ionic conductivity and dielectric properties of $Ba_{1-x}Sn_xF_2$ solid solutions prepared by mechanochemical milling", **Materials Science and Engineering B 178**, 965 (2013).

27- **M.M. Ahmad***, Y. Yamane, and K. Yamada

"Structure, ionic conduction, and giant dielectric properties of mechanochemically synthesized $BaSnF_4$", **Journal of Applied Physics**, Vol. **106**, 074106 (2009).

26- **M.M. Ahmad*** and K. Yamada

"Hopping rates and concentration of mobile fluoride ions in $Pb_{1-x}Sn_xF_2$ solid solutions", **The Journal of Chemical Physical**, Vol. **127**, 124507 (2007).

25- **M.M. Ahmad***, Y. Yamane, K. Yamada and S. Tanaka

"Dielectric relaxation properties of $Pb_{1-x}Sn_xF_2$ solid solutions prepared by mechanochemical milling", **Journal of Physics D: Applied Physics**, Vol. **40**, 6020 (2007).

24- **M.M. Ahmad*** and K. Yamada

"Superionic $PbSnF_4$: A giant dielectric constant material", **Applied Physics Letters**, Vol. **91**, 052912 (2007).

23- M.A. Gaffar*, **M.M. Ahmad**, K. Yamada and T. Okuda
"The double-peak phenomenon of the phase transition of Rb substituting K in $LiKSO_4$, competition between Rb sub-lattice and smearing the phase transition", **Journal of Physics D: Applied Physics**, Vol. **40**, 4360 (2007).

22- **M.M. Ahmad***, K. Yamada, P. Meuffels and R. Waser

"Aging-induced dielectric relaxation in barium titanate ceramics", **Applied Physics Letters**, Vol. **90**, 112902 (2007).

21- **M.M. Ahmad***, M.A. Gaffar, K. Yamada and T. Okuda

"Ion dynamics and structure-dependent conductivity scaling properties in polycrystalline $LiK_{1-x}Rb_xSO_4$", **Journal of Physics and Chemistry of Solids**, Vol. **68**, 470 (2007).

20- J.R. Macdonald* and **M.M. Ahmad**

"Slopes, nearly constant loss, universality, and hopping rates for dispersive ionic conduction", **Journal of Physics: Condensed Matter**, Vol. **19**, 046215 (2007).

19- **M.M. Ahmad***, S.A. Makhlouf and K.M.S. Khalil

"Dielectric behavior and ac conductivity of NiO/Al_2O_3 nanocomposites in humid atmosphere", **Journal of Applied Physics**, Vol. **100**, 094323 (2006).

18- **Mohamad M Ahmad***

"Ionic conduction and dielectric relaxation in polycrystalline Na_2SO_4", **Solid State Ionics**, Vol. **177**, 21 (2006).

17- **M.M. Ahmad***, E. Yousef and E. Mostfa

"Dielectric properties of the ternary TeO_2-Nb_2O_5-ZnO glasses", **Physica B**, Vol. **371**, 74 (2006).

16- **Mohamad M Ahmad***

"Estimation of the charge-carrier concentration and ac-conductivity scaling properties near the V-I phase transition of polycrystalline Na_2SO_4", **Physical Review B**, Vol. **72**, 174303 (2005).

15- **Mohamad M Ahmad***

(**Invited paper**) "Ionic conduction and relaxation in some superionic fluoride ion conductors", in "*Defects and Diffusion in Halides and Ice – A 7-Year Retrospective*", edited by David J. Fisher (Trans Tech Publications Inc., Switzerland), pp. 1-27 (2004).

14- K. Yamada, **M.M. Ahmad***, Y. Ogiso, T. Okuda, J. Chikami, G. Miehe, H. Ehrenberg and H. Fuess

"Two dimensional fluoride ion conductor $RbSn_2F_5$ studied by impedance spectroscopy and ^{19}F, ^{119}Sn and ^{87}Rb NMR", **The European Physical Journal B**, Vol. **40**, 167 (2004).

13- **M.M. Ahmad***, K. Yamada and T. Okuda

"Conductivity spectra and comparative scaling studies of polycrystalline $PbSnF_4$", **Solid State Ionics**, Vol. **167**, 285 (2004).

12- K. Yamada*, **M.M. Ahmad**, H. Ohki, T. Okuda, H. Ehrenberg and H. Fuess

"Structural phase transition of the two-dimensional fluoride ion conductor KSn_2F_5 studied by X-ray diffraction", **Solid State Ionics**, Vol. **167**, 301 (2004).

11- **M.M. Ahmad***, K. Yamada and T. Okuda

"Ionic conduction and relaxation in KSn_2F_5 fluoride ion conductor", **Physica B**, Vol. **339**, 94 (2003).

10- **M.M. Ahmad***, M.A. Hefni, A.H. Moharram, G.M. Shurit, K. Yamada and T. Okuda, "Fluoride ion dynamics and relaxation in KSn_2F_5 studied by ^{19}F NMR and impedance spectroscopy", **Journal of Physics: Condensed Matter**, Vol. **15**, No. 31, 5341 (2003).

9- **M.M. Ahmad***, K. Yamada and T. Okuda

"Fluoride ion diffusion of superionic $PbSnF_4$ studied by NMR and impedance spectroscopy", **Journal of Physics: Condensed Matter**, Vol. **14**, 7233 (2002).

8- **M.M. Ahmad*,** K. Yamada and T. Okuda

"Frequency dependent conductivity and dielectric studies on $RbSn_2F_5$", **Solid State Communications**, Vol. **123**, 185 (2002).

7- **M.M. Ahmad*** and M.A. Hefni

"Effect of Li content on the DSC and electrical conductivity of $(Li_{1-x}K_x)_2SO_4$ mixed crystals", **Zeitschrift fur Naturforschung A**, Vol. **56**, 677 (2001).

6- M.A. Osman, M.A. Hefni*, R.M. Mahfouz and **M.M. Ahmad**

"γ-irradiation effect on the electrical properties of $LiKSO_4$", **Physica B**, Vol. **301**, 318, (2001).

5- **M.M. Ahmad*** and M.A. Hefni

"DSC and electrical conductivity studies of $(Li_{1-x}K_x)_2SO_4$ mixed crystals", **Radiation Effects and Defects in Solids**, Vol. **153**, 359 (2001).

4- M.A. Hefni*, M.A. Osman, R.M. Mahfouz and **M.M. Ahmad**

"γ-irradiation effect on the spectroscopic and electrical properties of K_2SO_4-Na_2SO_4 mixed system", **Radiation Effects and Defects in Solids**, Vol. **153**, 151 (2001).

3- M.A. Osman, M.A. Hefni, R.M. Mahfouz and **M.M. Ahmad***

"Spectroscopic studies and electrical conductivity behavior of γ-irradiated Li_2SO_4-Na_2SO_4 mixed system", **Radiation Effects and Defects in Solids**, Vol. **153**, 115 (2001).

2- M.A. Hefni, M.A. Osman, R.M. Mahfouz and **M.M. Ahmad***

"Electron paramagnetic resonance, infrared, and electrical conductivity studies of γ-ray irradiated Li_2SO_4- K_2SO_4 mixed system", **Radiation Effects and Defects in Solids**, Vol. **152**, 255 (2000).

1- M.A. Hefni, M.A. Osman, R.M. Mahfouz and **M.M. Ahmad**

"Electron paramagnetic resonance studies of γ-ray irradiated Li_2SO_4- K_2SO_4 mixed crystals", **Arab Journal of Nuclear Sciences and Applications**, Vol. **32**, 190 (1999).

(* : **Corresponding Author**)

Presentations in International and National Meetings

1- **M.M. Ahmad**

"Conventional and spark plasma sintering of $Na_{1/2}Bi_{1/2}Cu_3Ti_4O_{12}$ giant dielectric ceramics"

Electronic Materials and Applications 2016 conference, Orlando, Florida, USA, Jan. 21-23, 2016.

2- **M.M. Ahmad**

"Understanding the ionic conductivity enhancement in lithium conducting garnets"

Electronic Materials and Applications 2016 conference, Orlando, Florida, USA, Jan. 21-23, 2016.

3- **M.M. Ahmad***

"Mechanosynthesis and Spark Plasma Sintering of Fine-Grained $Na_{1/2}Bi_{1/2}Cu_3Ti_4O_{12}$ Ceramics with Giant Dielectric Response"

NanoPT 2015 "NnaoPortugal International Conference 2015", Porto, Portugal, Feb 11 - 13, 2015.

4- **M.M. Ahmad***, N. Tajima and R. Kato

"Dielectric properties of organic conductor α-$(BEDT\text{-}TTF)_2I_3$"

The 64th annual meeting of the Physical Society of Japan, March 2009.

5- **M.M. Ahmad*** and K. Yamada

"Ion dynamics and giant dielectric constant in $Pb_{1-x}Sn_xF_2$ solid solutions"

The 1st Egypt – Japan International Symposium on Science and Technology, 8 – 10 June 2008, Waseda University, Tokyo, Japan.

6- **M.M. Ahmad*** and K. Yamada

"Ionic conduction and relaxation properties in mechanochemically synthesized $BaSnF_4$"

The 2nd International Conference on Physics of Solid State Ionics, 16 – 19 December 2007, Tokyo Institute of Technology, Yokohama, Japan.

7- **M.M. Ahmad*** and K. Yamada

"Ion dynamics and giant dielectric properties in nanocrystalline $Pb_{1-x}Sn_xF_2$ solid solutions"

The 1st International Conference on Materials Science & Technology (Future Challenges), 2 – 4 December 2007, National Research Center, Cairo, Egypt.

8- **M.M. Ahmad***, Y. Yamane and K. Yamada

" Ionic conduction and relaxation phenomena in solid solutions between lead fluoride and tin fluoride "

The 87th Spring Meeting of the Chemical Society of Japan, 25 – 28 March 2007, Kansai University, Osaka, Japan.

9- K. Yamada*, H. Suzuki, **M.M. Ahmad** and Y. Yamane

" Lithium ion conductivity of halide spinel "

The 87th Spring Meeting of the Chemical Society of Japan, 25 – 28 March 2007, Kansai University, Osaka, Japan.

10- K. Yamada*, H. Suzuki, **M.M. Ahmad** and Y. Yamane

" Lithium ion conductivity for spinel halides "

The 32nd Symposium on Solid State Ionics, 27 – 29 Nov. 2006, Kyushu University, Kyushu, Japan.

Google Scholar: https://scholar.google.com/citations?user=VaYmCbgAAAAJ&hl=en&oi=ao

Research Gate: https://www.researchgate.net/profile/Mohamad_Ahmad7