CURRICULUM VITAE

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Date of birth: December 24, 1965

Place of birth: Um El Fahem, Israel

Marital status: Married and five children

EDUCATION:

Ph.D. 1998 Physics, "Irradiation physics"

Ben-Gurion University of the Negev

Dissertation: Supralinearity and Sensitisation in LiF:Mg,Ti (TLD-100): The Unified Interaction Model (UNIM) applied to gamma rays and electrons.

M.Sc. 1993 Physics, "Irradiation Physics"

Ben-Gurion University of the Negev

B.Sc. 1988 Physics.

Tel-Aviv University

Teaching Certificate, 1996, Physics

Ben-Gurion University of the Negev

ACADEMIC EXPERIENCE

I have experience in the field of Radiation Physics at Ben-Gurion University.
1989-1992: I studied the effect of thermal annealing on defect structure and thermoluminescence in LiF:Mg,Cu,P..
1992-1998: I developed a theoretical model (The Unified Interaction Model, UNIM) that explains all the phenomena observed in the field of Supralinearity and

sensitization in F:Mg,Ti. The unified interaction model (UNIM) is based on both radiation absorption stage and recombination stage mechanisms. The UNIM incorporates both track interaction model (TIM) for heavy charge particles and the defect interaction model (DIM) for isotropically ionizing gamma rays and electrons, in a unified and self-consistent conceptual and mathematical formalism.

2015-: **Light-matter strong coupling**

When electromagnetic radiation is confined into tiny regions, the interaction nature of the radiation with matter becomes of great interest from both the fundamental point of view as well as for many optical engineering applications. This radiation confinement, usually accompanied by an extraordinary enhancement of the electric field intensity, accounts for many interesting effects, such as surface enhanced Raman scattering (SERS), enhanced optical transmission, enhanced absorption and emission of light, and enables high-resolution microscopy and imaging. However, these effects are the outcomes of a weak light-matter interaction where the properties of the material do not change.

In the strong coupling regime, on the other hand, a resonant optical field can also couple to the transition dipole moment of a material, oscillating with a given frequency, and give rise to two new hybrid-light-matter states that are separated by the vacuum Rabi frequency. This regime is typically achieved by placing the material in the confined electromagnetic field of an optical cavity or a surface plasmon mode that is resonant with a given material transition.

In this research we study the interaction nature of light in confined regions with matter. In the weak coupling regime, we exploit the enhanced electromagnetic field to boost optical phenomena for bio sensing, diseases diagnoses, and molecular detection. In the strong coupling regime, we investigate the modification in the materials properties due to the formation of the new hybrid states.

TEACHING EXPERIENCE

1989-1997: Teaching assistant in physics and engineering department at Ben-Gurion University (Mechanics and Electricity courses and tutor in Physics laboratory)

1993-1999: Physics teacher at Umm El Fahem high school.

ORT Braude College (1998-):

Undergraduate Courses:

Physics 1 (mechanics)
Physics 2 (electricity, magnetism & waves)
Physics 3 (waves, special relativity & modern physics)
Physics, for completion studies in mechanical engineering
Basic course in physics

Technion (2007-2021)

Physics 1, 1m (mechanics)
Physics 2, 2mm (electricity, magnetism & waves)

The Active Learning Project

The project of Active Learning was first introduced into the college in the year 2005. The project has been particularly, but not exclusively, implemented in physics courses. The people who initiated the project were largely motivated by a desire to tackle students' substantial failure in physics courses. I have been working on developing teaching materials based on the above approach for a course in mechanic physics.

RESEARCH INRFREST

Thermoluminescence in Solids: this is a physical phenomenon involving the emission of mainly visible light due to (1) exposure of these solids to ionizing radiation and (2) heating these solids.

PROFESSIONAL ACTIVITIES

- Students physics workshop
- Member of the Academic Affairs Committee
- 2007-2011: Counselor of minority students
- Chairman of the Academic Affairs Committee 2023-

LIST OF PUBLICATIONS

A. Refereed Papers:

1. S. Mahajna, D. Yossian, and Y.S. Horowitz, "Defect Mechanisms in the Thermoluminescence of LiF:Mg,Cu,P", Radiat. Effs. and Defects in Solids,136: 181-185 (1995).

2. Y.S. Horowitz, M. Rosenkrantz, S. Mahajna and D. Yossian. "The Track Interaction model for alpha particle induced thermoluminescence supralinearity: Dependence of the supralinearity on the vector properties of the alpha particleradiation field", J. Phys. D: Appl. Phys., 29, 205-217 (1996).

3. Y.S. Horowitz, S. Mahajna , M. Rosenkrantz, "Unified Approach to gamma and heavy charged particle supralinearity: The Track Defect Interaction Model", Radiat. Prot. Dos., 65: 7-12, (1996).

4. S. Mahajna, and Y.S. Horowitz. "The Unified Interaction Model applied to the gamma induced supralinearity and sensitisation of peak 5 in LiF:Mg,Ti (TLD-100)", J. Phys. D: Appl. Phys., 30: 2603-2619 (1997).

5. Y.S. Horowitz, S. Mahajna, L. Oster, Y. Weizmann, D. Satinger and D. Yossian . The Unified Interaction Model applied to the gamma induced supralinearity and sensitisation of peaks 4 and 5 in LiF:Mg,Ti (TLD-100)", Radiat. Prot. Dosim., 78: 169-193 (1998).

6. Y.S. Horowitz, S. Mahajna and L. Oster, Y. Weizman, D. Satinger and D. The Unified Interaction Model applied to the gamma induced supralinearity and sensitisation of peaks 4 and 5 in LiF:Mg,Ti (TLD-1. Radiat. Prot. Dos., 78: 169-193 (1998).

7. Y.S. Horowitz and S. Mahajna, Invited paper to the 12th Int. Conf. Solid State Dosimetry , "The Unified Interaction Model applied to the gamma induced supralinearity and sensitisation of peaks 4 and 5 in LiF:Mg,Ti (TLD-100)", Radiat. Prot. Dosimetry, 84: 29-34, (1999).

8. S. Mahajna, D. Guetta, S. Lulinsky, S. Krylov, and Y. Linzon, "Liquid Mass Sensing Using Resonating Microplates Under Harsh Drop and Spray Condition", Physics Research International, Volume 2014, Article ID 320324.

9. S. Mahajna, M. Neumann, O. Eyal and A. Shalabney, "Plasmon-waveguide resonances with enhanced Figure-of-Merit and their potential for anisotropic bio-sensing in the Near infrared region", Journal of Sensors, Volume 2016 (2016), Article ID 1898315.

10. F. Sakran, S. Mahajna and A. Shalabney, "Leaky coupled waveguide- Plasmon modes for enhanced light-matter interaction ", Sensors **2025**, 25, 1550.

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B. Refereed Conference Proceedings

1. D. Yossian, S. Mahajna, B. Ben Shachar and Y.S. Horowitz, "Re-investigation of the kinetic trapping parameters of peak 5 in TLD-100 via "Prompt" and "Residual" Isothermal decay", In Proc. 10th Int. Conf. Solid State Dosimetry, Wash. D.C. 1992: Radiat. Prot. Dos., 47: 129-133, (1993).

2. S. Mahajna, D. Yossian, Y.S. Horowitz and A. Horowitz, "Kinetic trapping parameters in LiF:Mg,Cu,P via "Prompt" and "Residual" Isothermal Decay", In Proc.10th Int. Conf. Solid State Dosimetry, Wash. D.C. 1992; Radiat. Prot. Dos., 47: 73-77, (1993).

4. D. Yossian, S. Gimplin, S. Mahajna and Y.S. Horowitz, "Kinetics of isolated peak 5 in LiF:Mg,Ti following 165oC post-irradiation annealing" , Int. Symp.on Luminescent Detectors and Transformers of Ionising Radiation, LUMDETR-94, Sept. 1994, Tallinn, Estonia. Radiat. Meas. 24:387-393 (1995).

5. S. Mahajna, D. Yossian and Y.S. Horowitz, "The effect of thermal annealing on defect structure and thermoluminescence in LiF:Mg,Cu,P", Int. Symp. on Luminescent Detectors and Transformers of Ionising Radiation, LUMDETR-94, Sept. 1994, Tallinn, Estonia. Radiat. Meas., 24: 395-400 (1995)

6. D. Yossian, S. Gimplin, S. Mahajna and Y.S. Horowitz, "Peak shape analysis of isolated peak 5 in LiF:Mg,Ti following 165oC post-irradiation annealing", In Proc. 11th Int. Conf. Solid State Dosimetry, Budapest, 1995. Radiat. Prot. Dosim.65, pp. 173-178 (1996).

7. Y. Linzon, S. Mahajna, D. Guetta, S. Lulinsky, S. Krylov, "Electro-optically based liquid mass sensor using resonating micro-plate under harsh drop and spray condition" International Conference Optical MEMS and Nanophotonics (OMN), 2014, 125-126

8. S. Mahajna, Y. Linzon, "Liquid mass sensing with resonant micro-plate under harsh drop and spray condition", Photonic Networks and Devices, JT3A. 36

C. Abstracts

3. S. Mahajna, D. Yossian and Y.S. Horowitz, "The effect of thermal annealing on defect structure and thermoluminescence in LiF:Mg,Cu,P", Abstract PTuIII6, p. 127, Seventh Europhysical Conference on Defects in Insulating Materials, EURODIM 94, July 5-8, 1994; Lyons France.

D. ORT Braude College Publication:

1. J. Berger, S. Mahajna, N. Netzer, Problem booklet for Physics 3 course