

# Arshak Lyudvig Vardanyan

## Institute of Physics

Chair of Solid State Physics

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## Language skills

English Русский Deutsch

## Publications

*Article*

### **Intermediate interaction theory of the Dirac fermions with plasmon-surface LO-phonon excitations in the monolayer graphene on polar substrate**

Arshak L.Vartanian

Journal of Physics and Chemistry of Solids 2022 110790

*Article*

### **Simultaneous effects of the confinement of polar optical phonons and spin-orbit coupling on the free carrier absorption of a nanowire**

A.L. Vartanian, T.K. Ghukasyan, A.L. Asatryan, K.A. Vardanyan, A.A. Kirakosyan

Micro and Nanostructures (Previously known as Superlattices and Microstructures) 2022 207287

*Article*

### **Polaronic effects on the electron Raman scattering in a spherical anisotropic quantum dot**

T.K. Ghukasyan, A.L. Asatryan, L.A. Vardanyan, A.A. Kirakosyan, A.L. Vartanian

Armenian Journal of Physics 2022 175-181

*Article*

### **External electric and magnetic field effects on the polaron in a wurtzite nitride nanowire embedded in a nonpolar matrix**

Anna L. Asatryan, Ashot H. Movsisyan, Arshak L. Vartanian

EUROPEAN PHYSICAL JOURNAL B 2021 id 70/8

*Manual*

### **Պինդ մարմնի ֆիզիկայի լաբորատոր աշխատանքներ. մաս 2**

Արթուր Կիրակոսյան, Արշակ Վարդանյան, Աննա Ասատրյան, Արամ Մանասեյան,

Վալերի Հարությունյան

2021 190

*Article*

### **Polaronic effects on the impurity-related linear and nonlinear optical properties in a nanowire with magnetic field**

Arshak L. Vartanian, Tigran K. Ghukasyan

Micro and Nanostructures (Previously known as Superlattices and Microstructures) 2020 106339(1-13)

Article

**Possible Frohlich surface polaron formation in graphene on a polar substrate**

Arshak L. Vartanian

Physica E: Low-dimensional Systems and Nanostructures 2020 113847(1-5)

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Article

**Effect of spin-orbit coupling on the hot-electron energy relaxation in nanowires**

A. L. Vartanian, A. L. Asatryan, A. G. Stepanyan, K. A. Vardanyan, A. A. Kirakosyan

International Journal of Modern Physics B 2020 2050322(1-13)

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Article

**Influence of image charge effect on the binding energy of hydrogen-like donor impurity in a near-surface quantum well under transverse electric field**

A.L. Vartanian, A.L. Asatryan, A.A. Kirakosyan, K.A. Vardanyan

Physica E: Low-dimensional Systems and Nanostructures 2019 1-4

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Article

**Influence of image charges on the impurity-related optical properties of near-surface quantum wells under a transverse electric field**

A.L. Vartanian, A.L. Asatryan, L.A. Vardanyan

Physica E: Low-dimensional Systems and Nanostructures 2019 115-120

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Article

**Polaron and dielectric mismatch effects on impurity-related optical absorption and refractive index changes in a spherical quantum dot**

A.L. Vartanian, A.L. Asatryan, L.A. Vardanyan

Micro and Nanostructures (Previously known as Superlattices and Microstructures) 2018 442-458

<https://www.journals.elsevier.com/superlattices-and-microstructures>

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Article

**Impurity-Bound Polaronic States in ZnSe Quantum Dots Under Electric Field: Image Charge Effect**

A. Vartanian, A. Asatryan, L. Vardanyan

JOURNAL OF ELECTRONIC MATERIALS 2018 4303-4307

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Article

**Effect of Rashba spin-orbit coupling on polaron properties in CdSe nanowire under electric field**

A.L.Vartanian, L.A.Vardanyan

Micro and Nanostructures (Previously known as Superlattices and Microstructures) 2018 224-228

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Article

**Spin relaxation mediated by spin-orbit and acoustic phonon interactions in a single-electron two-dimensional quantum dot**

A.L. Vartanian, A.A. Kirakosyan, K.A. Vardanyan

Micro and Nanostructures (Previously known as Superlattices and Microstructures) 2018 548-556

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Article

**Energy loss rate of hot electrons due to polar-optical phonon modes in a semiconductor nanowire under transverse electric field**

A. Stepanyan, A. Asatryan, M. Yeranosyan, K. Vardanyan, A. Kirakosyan, A. Vartanian  
Physica B: Condensed Matter 2018 340-346

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*Article*

**Influence of image charge effect on impurity-related optical absorption coefficients and refractive index changes in a spherical quantum dot.**

A.L. Vartanian, A.L. Asatryan, L.A. Vardanyan

Micro and Nanostructures (Previously known as Superlattices and Microstructures) 2017 205-212

<http://www.journals.elsevier.com/superlattices-and-microstructures>

---

*Article*

**Energy-loss rate of hot electrons due to confined acoustic phonon modes in a semiconductor quantum wire under transverse electric field.**

A. Stepanyan, M. Yeranosyan, L. Vardanyan, A. Asatryan, A. Kirakosyan, A. Vartanian

Physica B: Condensed Matter 2017 102-107

<http://www.journals.elsevier.com/physica-b-condensed-matter>

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*Article*

**Frohlich polaron in nanowire with Rashba and Dresselhaus spin-orbit couplings**

Arshak Vartanian, Albert Kirakosyan, Karen Vardanyan

Micro and Nanostructures (Previously known as Superlattices and Microstructures) 2017 655-661

<http://www.journals.elsevier.com/superlattices-and-microstructures>

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*Article*

**EFFECTS OF ELECTRIC FIELD AND IMAGE CHARGES ON THE IMPURITY-RELATED OPTICAL ABSORPTION COEFFICIENTS IN A SPHERICAL QUANTUM DOT**

A.L. Vartanian, A.L. Asatryan, A.A. Kirakosyan, A.A. Mkhitarian, S.S. Avetisyan

Proceedings of the YSU. Physical and Mathematical Sciences 2017 124-127

<http://www.yasu.am/science/en/journals>

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*Article*

**ONE-DIMENSIONAL FRÖHLICH POLARON WITH SPIN-ORBIT COUPLING**

K. Vardanyan, A. Kirakosyan, A. Vartanian

Вестник Российско-Армянского Университета: Физико-математические и естественные науки 2017 41-46

<http://science.rau.am/rus/50/701>

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*Article*

**Influence of spin-orbit interactions on the polaron properties in wurtzite semiconductor quantum well**

Mkrtich A. Yeranosyan, Arshak L. Vartanian, Karen A. Vardanyan

Physica E: Low-dimensional Systems and Nanostructures 2016 330-335

<http://www.journals.elsevier.com/physica-e-low-dimensional-systems-and-nanostru...>

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*Article*

**Influence of the image charge effect on the hydrogen-like impurity-bound polaron in a spherical quantum dot in the presence of an electric field**

Arshak L. Vartanian, Lyudvig A. Vardanyan

Physica E: Low-dimensional Systems and Nanostructures 2016 174-180

<http://www.journals.elsevier.com/physica-e-low-dimensional-systems-and-nanostru...>

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Article

**Image Charge and Electric Field Effects on Hydrogen-like Impurity-bound Polaron Energies and Oscillator Strengths in a Quantum Dot**

L.A. Vardanyan, A.L. Vartanian, A.L. Asatryan, A.A. Kirakosyan

JOURNAL OF ELECTRONIC MATERIALS 2016 5847-5852

<http://www.springer.com/materials/optical+%26+electronic+materials/journal/11664>

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Article

**Electric field and image charge effects on impurity-bound polarons in a CdS colloidal quantum dot embedded in organic matrices**

A.L.Asatryan, A.L.Vartanian, A.A.Kirakosyan, L.A.Vardanyan

Physica B: Condensed Matter 2016 70-74

<http://www.journals.elsevier.com/physica-b-condensed-matter>

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Manual

**Պինդ մարմնի ֆիզիկայի լաբորատոր աշխատանքներ մաս I**

Ալբերտ Կիրակոսյան, Արշակ Վարդանյան, Աննա Ասատրյան, Արամ Մանասեյան,

Գառնիկ Վերմիշյան

2016 168

---

Article

**The influence of electric field on the interface polaron properties in a wurtzite nitride nanowire.**

Anna L. Asatryan, Karen A. Vardanyan, Arshak L. Vartanian

Micro and Nanostructures (Previously known as Superlattices and Microstructures) 2015 286-294

<http://www.journals.elsevier.com/superlattices-and-microstructures>

---

Article

**Polaronic effects due to quasi-confined optical phonons in wurtzite nitride nanowire in the presence of an electric field.**

Karen A. Vardanyan, Anna L. Asatryan, Arshak L. Vartanian

Micro and Nanostructures (Previously known as Superlattices and Microstructures) 2015 588-594

<http://www.journals.elsevier.com/superlattices-and-microstructures>

---

Article

**The influence of electric field on the quasi-confined and interface polaron basic parameters in a wurtzite nitride quantum wire.**

A.L. Asatryan, K.A. Vardanyan, A.L. Vartanian, A.A. Kirakosyan

Journal of Physics: Conference Series 2015 012048/1-4

<http://iopscience.iop.org/journal/1742-6596>

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Article

**Confined acoustic phonon-mediated spin relaxation in a twodimensional quantum dot in the presence of perpendicular magnetic field**

K A Vardanyan, A L Vartanian, A G Stepanyan, A A Kirakosyan

Journal of Physics: Conference Series 2015 012043 /4pp

<http://iopscience.iop.org/journal/1742-6596>

---

Article

**Electron capture processes in quantum dots due to one-and two-phonon assisted transitions:**

## **The role of optical phonon confinement**

A L Vartanian, K A Vardanyan, V N Mughnetsyan, A A Kirakosyan

Journal of Physics: Conference Series 2015 012017/4pp

<http://iopscience.iop.org/journal/1742-6596>

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*Article*

## **Effect of Phonon Confinement on Optical Phonon-Mediated Carrier Capture into CdSe/ZnS Quantum Dots**

K.A. Vardanyan, A.L. Vartanian, A.A. Kirakosyan

JOURNAL OF ELECTRONIC MATERIALS 2015 2779-2785

<http://www.springer.com/materials/optical+%26+electronic+materials/journal/11664>

---

*Article*

## **Effect of phonon confinement on one- and two-polar optical phonon capture processes in quantum dots**

K.A. Vardanyan, A.L. Vartanian, V.N. Mughnetsyan, A.A. Kirakosyan

Physica E: Low-dimensional Systems and Nanostructures 2015 268-274

<http://www.journals.elsevier.com/physica-e-low-dimensional-systems-and-nanostru...>

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*Article*

## **Phonon confinement effect on the polaron states in a double quantum ring structure in the presence of electric and magnetic fields**

Mkrtich A. Yerosyan, Arshak L. Vartanian, Abbas Shahbandari, Albert A. Kirakosyan

Physica B: Condensed Matter 2015 365-370

<http://www.journals.elsevier.com/physica-b-condensed-matter>

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*Manual*

## **Պիևդ մարմնի ֆիզիկայի խնդիրներ, Մաս I**

Ա.Ա. Կիրակոսյան, Ա.Լ. Վարդանյան, Ա.Լ. Ասատրյան

2015 154

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*Conference*

## **Effect of image charges on the impurity-bound polaronic states in colloidal quantum dots embedded in different organic matrices.**

A.L. Vartanian, A.L. Asatryan, L.A. Vardanyan, A.A. Kirakosyan

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*Conference*

## **Spin-orbit interaction enhanced polaron effect in wurtzite semiconductor quantum well.**

M.A. Yerosyan, K.A. Vardanyan, A.L. Vartanian, A.A. Kirakosyan

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*Conference*

## **Spin Relaxation in the Presence of Spin-Orbit Interactions in Single Electron Quantum Dots Embedded in a Suspended Phonon Cavity**

A.L. Vartanian, K.A. Vardanyan, A.A. Kirakosyan

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*Conference*

## **The influence of electric field on the quasi-confined and interface polaron basic parameters in a wurtzite nitride quantum wire.**

A.L. Asatryan, K.A. Vardanyan, A.L. Vartanian, A.A. Kirakosyan

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Conference

**Effect of Rashba and Dresselhaus spin-orbit interactions on the polaron properties in wurtzite semiconductor quantum dot in the presence of external fields.**

M.A. Yerosyan, K.A. Vardanyan, A.L. Vartanian, A.A. Kirakosyan

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Conference

**Confined acoustic phonon-mediated spin relaxation in a two-dimensional quantum dot in the presence of perpendicular magnetic field.**

K.A. Vardanyan, A.L. Vartanian, A.A. Kirakosyan

---

Conference

**Electron capture processes in quantum dots due to one- and two-phonon assisted transitions: The role of optical phonon confinement.**

A.L. Vartanian, K.A. Vardanyan, V.N. Mughnetsyan, A.A. Kirakosyan

---

Conference

**Dilatational and flexural acoustic-phonon mediated spin relaxation in a two-dimensional quantum dot in the presence of perpendicular magnetic field.**

Arshak Vartanian, Karen Vardanyan, Armen Stepanyan, Albert Kirakosyan

---

Conference

**Impurity-bound polaronic states under an external electric field in quantum dots: Image charge effect.**

Lyudvig Vardanyan, Arshak Vartanian, Anna Asatryan

---

Conference

**Electric field effect on hot-electron energy-loss rate via LA-phonon scattering in a cylindrical quantum wire.**

A. Stepanyan, L. Vardanyan, A. Asatryan, A. Vartanian, A. Kirakosyan

---

Conference

**Rashba and Dresselhaus spin-orbit coupling effects on the electronic structure of quantum wires under the influence of in-plane magnetic field.**

V. Arzumanyan, K. Vardanyan, A. Asatryan, A. Vartanian

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Conference

**Influence of image charge effect on impurity-related optical absorption coefficient in a spherical quantum dot.**

A. Mkhitarian, L. Vardanyan, A. Asatryan, A. Vartanian

---

Conference

**Confined and interface polar optical phonon-limited electron mobility in quantum wires in the presence of perpendicular electric field.**

K. Vardanyan, Y. Brsoyan, A. Vartanian, A. Kirakosyan

---

Conference

**Influence of Phonon Confinement on Optical Phonon-Mediated Carrier Capture into CdSe/ZnS/H<sub>2</sub>O Quantum Dots**

Vartanian A, Vardanyan K, Kirakosyan A

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Conference

**Image charge effect on oscillator strength and intradonor absorption spectra under external electric field in quantum dots.**

Arshak Vartanian, Anna Asatryan, Lyudvig Vardanyan

---

Conference

**Quasi-one-dimensional Fröhlich polaron with spin-orbit Rashba and Dresselhaus couplings**

Karen Vardanyan, Arshak Vartanian, Albert Kirakosyan

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Conference

**Impurity-Bound Polaronic States in ZnSe Quantum Dots under Electric Field: Image Charge Effect**

A. Asatryan, L. Vardanyan, A. Vartanian

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Conference

**Effect of Rashba Spin-Orbit Coupling on Polaron Properties in CdSe Nanowire under Electric Field**

A. Vartanian, K. Vardanyan

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Conference

**Dielectric mismatch and polaron effects on optical-absorption spectra and refractive index changes associated with impurities in quantum dots**

Arshak Vartanian, Tigran Ghukasyan, Levon Samsonyan

---

Conference

**The influence of the transverse electric field on the hot electron energy loss rate via polar-optical phonons in nanowires**

A.Asatryan, A.Stepanyan, M.Yeranosyan, A.Kirakosyan, A.Vartanian

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Conference

**Magnetic field control of phononmediated decoherence of spin-based qubit in two-dimensional quantum dot embedded in a suspended slab**

Arshak L. Vartanian

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Conference

**Wurtzite-nitride quantum wires under electric and magnetic fields: Polaron basic parameters**

A.L. Asatryan, L.A. Vardanyan, A.A. Kirakosyan, A.L. Vartanian

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Ematerial

**Պինդ մարմնի ֆիզիկայի լաբորատոր աշխատանքներ**

Ալբերտ Կիրակոսյան, Արշակ Վարդանյան, Աննա Ասատրյան, Արամ Մանասեյան,

Գառնիկ Վերմիշյան

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Conference

**Exciton-Phonon Interaction in Elliptically Shaped Core-Shell Quantum Dots: Resonant Raman Scattering**

Asatryan A.L., Vardanyan L.A., Vartanian A.L.

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Conference

**Phonon-Assisted Optical Absorption for Nanowires with Spin-Orbit Coupling**

Ghukasyan T. K., Asatryan A.L., Vardanyan K.A., Kirakosyan A.A., Vartanian A.L.

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*Conference*

**First-order Raman spectra induced by the Fröhlich excitation-lattice interaction in a non-spherical core/shell nanocrystals**

Anna Asatryan, Ashot Movsisyan, Siranush Avetisyan, Tatevik Hayriyan, Arshak Vartanian

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*Conference*

**Exciton Resonant Raman Scattering in Colloidal Quantum Dots: The Role of the Frohlich-Type Interaction**

A. Asatryan, A. Movsisyan, L. Vardanyan, A. Vartanian

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*Conference*

**Intermediate Coupling Theory of the Dirac Fermions with Plasmon-Surface Polar Optical Phonon Excitations in the Monolayer Graphene on Polar Substrate**

Arshak Vartanian

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