



Abhijeet KUMAR

Prospective Doctoral Candidate

5th year integrated BS-MS student

Department of Physical Sciences,
Indian Institute of Science Education and Research (IISER) Kolkata, Nadia, WB, India, 741246

Email

ak13ms027@iiserkol.ac.in
abhjtik@gmail.com

Mobile

+91 8016 62 2840

Portfolio

<http://students.iiserkol.ac.in/-ak13ms027/>

ACADEMIC GOAL

To explore the physics of nano-materials and their role in our scientific development.

RESEARCH INTEREST

Nonlinear Optics, Spectroscopy, Carrier Dynamics in 2D materials; Optoelectronics

RESEARCH EXPERIENCE

Master's Thesis

June 2017
- present

Title: "Studies of Nonlinear Optical Properties in Graphene"

Guide: Dr. Bipul Pal, IISER Kolkata

Remarkable linear dispersion relation in graphene indicates its advanced optical behaviour. I am involved in learning various experimental techniques such as Z-scan and pump-probe method to observe optical nonlinearities in graphene and other 2-D materials, and to understand their carrier dynamics. I am using Spatial Self-Phase Modulation (SSPM) as another tool to observe thermo-optical nonlinearities in dispersed graphene.

Semester Project

March - April
2017

Title: "Low Temperature Power Dependent PL Study in GaAs Quantum Well" (LINK)

Guide: Dr. Bipul Pal, IISER Kolkata

Electronic structures of materials can be well understood by studying its interaction with light through photoluminescence (PL). A standard PL set up is constructed and the spectra at low temperature (4K) show PL dependence of AlGaAs/GaAs quantum well heterostructure on laser intensity and temperature. Underlying physics and carrier dynamics for this variation were studied.

Summer Internship

May - July
2016

Title: "Mechanics of a Suspended membrane: Case of Graphene" (LINK)

Guide: Dr. Manu Jaiswal, Indian Institute of Technology (IIT) Madras

Single-atom thickness, yet huge mechanical and elastic strength allows graphene to obtain certain configuration on top of a corrugated surface under finite strain or load. We understand the morphology of graphene layer on top of a nanosphere. First, we model the height profile of 1-D free-standing membrane and then extend this model into 3-D as in case of graphene. This load can be the tuning parameter for its application in electronic devices.

Summer Internship

May - July
2015

Title: "Strain-Induced Bandgaps in Graphene Nano-Ribbons" (LINK)

Guide: Dr. Rakesh Kumar, IIT Ropar

Because of its remarkable fundamental properties, graphene has evolved as a promising candidate in new generation electronics. Unlike semiconductors, zero bandgap in graphene limits its application. The huge mechanical strength of graphene allows us to apply strain to it, which alters its electronic properties and modifies its band gap. Using VASP, we perform a simulational study and observe the expected bandgap in GNRs under uniaxial strain.

SKILLS

- C
- python
- Matlab
- Mathematica
- LabVIEW
- Gnuplot
- Origin
- HTML

LANGUAGES

- English
- Hindi(M)
- Sanskrit
- Bangla

ENGLISH PROFICIENCY TEST

TOEFL	93/120
Reading	24
Listening	23
Speaking	22
Writing	24

HOBBIES

- Sports
- Blogging
- Travelling

INDEPENDENT STUDY

August-
January 2017

Title: "Studying Quantum Field Theory in Graphene "

Guide: Dr. Prashanta K Panigrahi, IISER Kolkata

This is an independent study course where I review several reported studies in order to understand electronic and energy transport in graphene.

CONFERENCE

December
2017

Poster presentation at CoOpt (Contemporary Trends in Optics)-2017, held at IISER Kolkata.

Title: "Investigation of Thermo-Optical Nonlinearities in Graphene and Graphene Oxide" ([LINK](#))

EDUCATION

2013
- present

Indian Institute of Science Education and Research (IISER) Kolkata
Final year integrated BS-MS student with Physics major
Current **CGPA: 8.23; Physics GPA: 8.49 (Scale of 10)**

2010 -
2012

Anugrah Narayan College, Patna, India
Higher Secondary Education with **77.2%** marks
Belonged to **top 1%** of total 0.35M students across state

2010

Government High School, Goraul, India
Secondary Education with **81.4%** marks
Belonged to **top 1%** of total 1M students across state

ACHIEVEMENTS

2017

All India Rank 47 in physics stream in **NET-JRF** (National Eligibility Test - Junior Research Fellowship) examination: Fellowship criterion for pursuing **doctoral** studies in India

2013 -
present

INSPIRE (Innovation in Science Pursuit for Inspired Research) Scholar
Funded by Department of Science and Technology, Government of India to **top 1%** students in the country for **pursuing Basic Sciences**.

2010

INSPIRE award
Funded by Department of Science and Technology, Government of India to students maintaining **outstanding** academic performance

2009 - 2012

National Means cum Merit Scholarship
Funded by Ministry of Human Resource and Development, Government of India.
Secured **first rank** in merit list in the district

OTHER ACTIVITIES

- Member of **SPIE** (International Society for Optics and Photonics)
- Attended several seminars and conferences as an undergraduate student
- Active on my science blog www.mysciencediaries.blogspot.in
- Experience of teaching secondary and higher secondary school students
- Winner of several quiz and debate competition at school and district level
- Possess certificates for participating in various social, cultural and sports activities