



2019-2021 in a Report

INSTITUTE OF NANO
OPTOELECTRONICS RESEARCH
AND TECHNOLOGY (INOR)

© Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia.

INOR 2019-2021 IN A REPORT

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Foreword by

DIRECTOR



ASSOC. PROF. TS. DR. MOHD ZAMIR PAKHURUDDIN **Director**

As a CoE in Research, INOR offers research, services, and academic programmes in the field of Optoelectronics and Nanotechnology. Services offered include processing, characterization, analysis, wafer products, training, and consultation related to optical and electronic materials and devices.

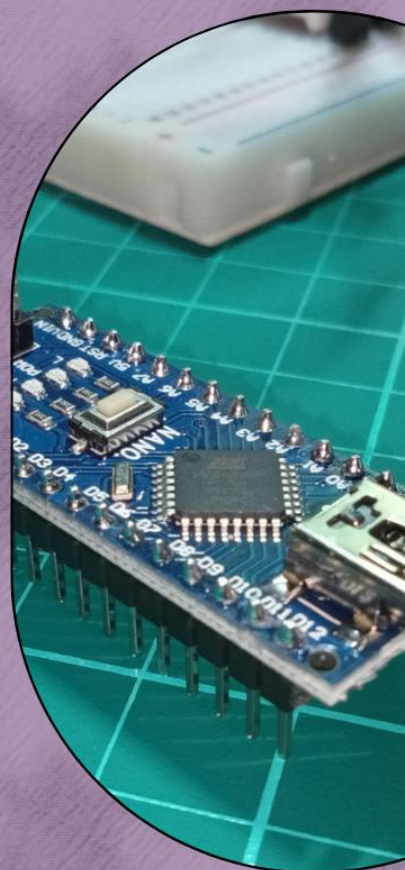
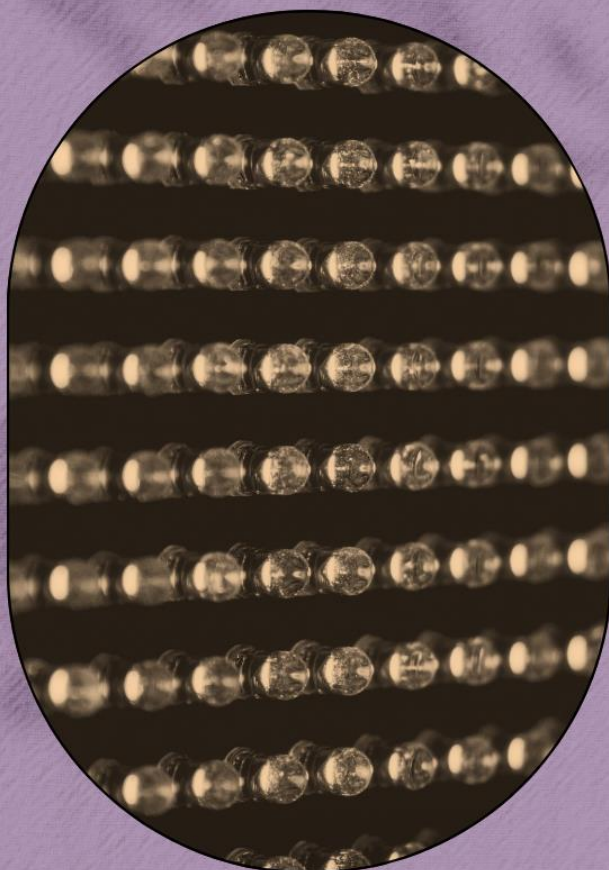
The facilities available in INOR are considered as state of the art for nano and advanced materials technology for optoelectronics and electronics applications especially in light emitting diode (LED) / laser, sensor, solar cell and power device research and development.



ABOUT INOR

INSTITUTE OF NANO OPTOELECTRONICS RESEARCH AND TECHNOLOGY (INOR)

*As a Centre of Excellence (CoE) in Research
and Innovation, INOR offers research and
academic programmes, as well as services
in the field of nanotechnology and
optoelectronics*





Institute of Nano Optoelectronics Research and Technology (INOR) is located at Sains@USM and is about **3 km** from the USM main campus and closed to the industry areas



Timeline



2002

- IRPA (Intensification of Research in Priority Areas) Strategic Research Grant
- RM 22.5 M



2004-2005

- Establishment of NOR Laboratory
- Fully Operational of Equipments and Facilities

2014

- The birth of INOR
- Centre of Excellence (COE)



2015

- Establishment of Administration Office at SAINS@USM



2017

- Readiness of Office and Research Laboratory




Vision

To become a global centre of excellence in multidisciplinary research field of nanotechnology and optoelectronics.

Mission

To provide high-impact research and academic programmes for global research prominence and development of local talents and technology for a sustainable nation.



INOR
FOCUS

Nano-optoelectronic Materials and Devices

Bahan & Peranti Nano-optoelektronik

5 Niche Areas: Align with Industry 4.0 & 10-10 MySTIE Framework

1

Nano and Advanced Materials

2

Light Emitting Diode / Laser

3

Sensor

4

Solar cell

5

Power Electronic Device

RM423J

Inisiatif R&D di bawah MOSTI dan KPT



RM295J

Peruntukan kepada universiti-universiti awam
untuk penyelidikan sains & teknologi

RM12J

Geran padanan melalui Collaborative
Research in Engineering, Science &
Technology (CREST) untuk bidang Gallium
Nitride (GaN) & LED dan kenderaan elektrik



**YB SENATOR DATO' SRI
TENGGU ZAFRUL
TENGGU ABDUL AZIZ
(BAJET2021)**

ADMINISTRATIVE STRUCTURE

DIRECTOR

Assoc. Prof. Ts. Dr. Mohd Zamir
Pakhuruddin



PROGRAM CHAIRMAN

Assoc. Prof. Dr.
Ng Sha Shiong



PROGRAM COORDINATOR

Dr. Lim Way
Foong



ASST. REGISTRAR

Wan Rosdan
Rozali



CHIEF SCIENCE OFFICER

Azraai Fahmi
Hamzah



CHIEF RESEARCH OFFICER

Mohd Anas
Ahmad

ADMINISTRATION STAFF

DIRECTOR

Assoc. Prof. Ts. Dr. Mohd Zamir
Pakhuruddin



SECRETARY

Nur Afiqah
Md Rejab



ASST. REGISTRAR

Wan Rosdan
Rozali



ADMIN ASSISTANT

Sanisah Ahmad



OPERATION ASSISTANT

Mohd Nazri
Bakar

LABORATORY & TECHNICAL STAFF



**CHIEF SCIENCE
OFFICER**

Azraai Fahmi Hamzah



**CHIEF
RESEARCH
OFFICER**

Mohd Anas Ahmad



**ASST. SCIENCE
OFFICER**

Rahmawatini Abd Rahman



**RESEARCH
OFFICER**

Nur Atiqah Hamzah



**ASST.
ENGINEER**

Syed Mohamad Syed Sahil



**RESEARCH
OFFICER**

Rahil Izzati Mohd Asri

ACADEMIC STAFF



- Assoc. Prof. Ts. Dr. Mohd Zamir bin Pakhuruddin
- Total Citation – 401
- H-Index – 12
- Area of Expertise – Solar Cells



- Prof. Dr. Zainuriah Hassan, FASc
- Total Citation – 6526
- H-Index – 37
- Area of Expertise – Wide bandgap semiconductor materials and devices, Material Sciences



- Ascc. Prof. Dr. Ng Sha Shiong
- Total Citation – 1263
- H-Index – 20
- Area of Expertise – Wide bandgap semiconductor materials, Material Sciences



- Assoc. Prof. Dr. Norzaini Zainal
- Total Citation – 303
- H-Index – 10
- Area of Expertise – Advanced Materials, Electronic Materials

ACADEMIC STAFF



- Dr. Lim Way Foong
- Total Citation – 640
- H-Index – 17
- Area of Expertise – Material Sciences – Electronic Materials



- Dr. Sabah M. Mohammad
- Total Citation – 230
- H-Index – 9
- Area of Expertise – Nanomaterials, Material Sciences



- Ts. Dr. Mohd Syamsul Nasyriq Samsol Baharin
- Total Citation – 137
- H-Index – 6
- Area of Expertise – High power device, Electrical and Electronic Engineering



- Dr. Quah Hock Jin
- Total Citation – 713
- H-Index – 18
- Area of Expertise – Material Sciences – Electronic Materials

ACADEMIC STAFF



- Dr. Mundzir Abdullah
- Total Citation – 244
- H-Index – 11
- Area of Expertise – Optical Physics, Non-Linear Optics, Quantum Optics



- Dr. Faezah Jasman
- Total Citation – 132
- H-Index – 4
- Area of Expertise – Visible Light Communications

ADJUNCT PROFESSOR

DATO' DR. MOHD SOFI OSMAN

Former Managing
Director & Vice
President,
Altera Corporation



PROF. DR. BOON S. OOI

Lecturer,
King Abdullah
University of Science
and Technology
(KAUST), Saudi Arabia

HONORARY DEGREE OF DOCTOR OF SCIENCE



**PROF. DR. SHUJI NAKAMURA
(2019)**

2014 Nobel Prize Laureate
in Physics

**DR. DAVID LACEY
(2021)**

R&D Director, ams OSRAM





LABORATORIES



INOR LABORATORIES

METAL ORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD) LAB

- High-temperature MOCVD system [Taiyo Nippon Sanso Corporation] (TNSC)
- Model SR4338KS-R(HT)



FABRICATION LAB

- E-Beam Evaporator (metals)
- E-Beam Evaporator (metal oxides)
- Inductive Couple Plasma Etching System
- High Temperature Furnace
- Rapid Thermal Processor System
- UV-Ozone Cleaner
- Others

INOR LABORATORIES

YELLOW ROOM

- Maskless Lithography
- Spin coater
- Optical Microscope
- Others



CHARACTERIZATION LAB

- High Resolution X-ray Diffraction System
- Probe Station with Micro-Positioner
- L-I-V Probe Station
- Mini PL Spectroscopy System
- Electroluminescence System
- Others



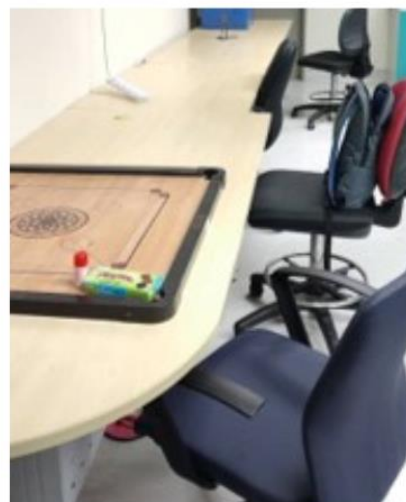
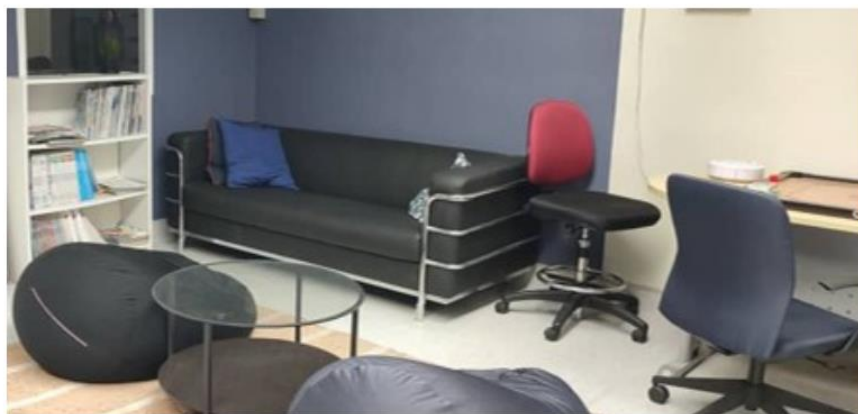
Smart Partnership Lab : NOR Lab, School of Physics



1. Molecular Beam Epitaxy
2. FESEM
3. HR-XRD
4. UV-Vis-NIR Spectrophotometer
5. AFM
6. PL/Raman
7. FTIR
8. Hall Effects System
9. Probe Station
10. Furnaces
11. Others



INOR FACILITIES



SERVICES OFFERED

- ✓ Sample Testing & Analysis
- ✓ Sample Preparations
- ✓ Chip Fabrication & Yellow Room Facilities
- ✓ Shortcourse, Upskilling & Reskilling Programmes (PDC)
- ✓ Consultancy & Contract Research
- ✓ Equipment & Facilities Leasing Package
- ✓ III-Nitrides Wafers





ACADEMIA & INDUSTRY
CLIENTS ARE
WELCOME!

INOR LABORATORY SERVICES

EPITAXIAL GROWTH

Metal Organic Chemical Vapor Deposition

MOCVD Growth services for III-Nitrides (GaN, InGaN, AlGaN, AlN) on sapphire substrate/bulk GaN

FABRICATION

Chip Fabrication with Yellow Room Facility

E-Beam Evaporator (Metal and metal oxide)

Inductive Couple Plasma Etching System (ICP)

Maskless Lithography

Rapid Thermal Processor System (RTP)

CHARACTER- IZATION

High Resolution X-Ray Diffraction System (HR-XRD)

Photoluminescence

Electroluminescence

Probe Station with Micropositioner

OTHERS

High Temperature Furnace
Single Zone Furnace
UV-Ozone Cleaner
Glove Box
Optical Microscope
Spin Coater

Degas Vacuum System
Laminar Flow Benches
Wet Benches
Microwave Chamber
Dip Coater

For enquiry and booking :

Dr. Mundzir Abdullah



+604-6535648



mundzireusm.my



<https://inor.usm.my>



PROFESSIONAL DEVELOPMENT COURSES

Available in Theoretical
Module and Experimental
Module

- Up to 3 days to 2 weeks per course
- Suitable for undergraduate and postgraduate students, researchers, governments and industries
- Includes access to laboratory
- More info :
<https://inor.usm.my>

Starting from
**RM 2500/
USD 650**
per course

Theoretical and Experimental
modules on the following
subjects:

- LED Technology
- Metal Organic Chemical Vapor Deposition (MOCVD)
- Fabrication and Characterization of GaN-based LED
- Packaging and Characterization of GaN-based LED
- Other Custom Topics



Ts. Dr. Mohd Syamsul
Nasyriq Samsol Baharin
Email: nasyriq@usm.my
Office no: 046535658

OUR CLIENTS



UTM
UNIVERSITI TEKNOLOGI MALAYSIA



اَوْنُوْرُ سَيِّدِي تَيَكُونُ لُوْ كِي مَبَارَا
**UNIVERSITI
TEKNOLOGI
MARA**



Curtin University
Malaysia

5W2H consulting
sdn bhd



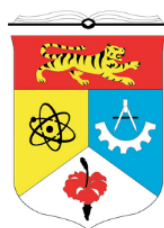
UMS
UNIVERSITI MALAYSIA SABAH



**UNIVERSITI
MALAYSIA
PERLIS**



يُونِيُوْرُسِيْتِي سُلْطَان زَيْن الْعَابِدِيْن
UNISZA
UNIVERSITI SULTAN ZAINAL ABIDIN



**UNIVERSITI
KEBANGSAAN
MALAYSIA**
*The National University
of Malaysia*

iLab
the partner that you can trust

LUMILEDS



INOR POSTGRADUATE PROGRAMMES

Research mode

- Doctor of Philosophy (PhD)
- Master of Science in Optoelectronics

Mixed mode

- Master of Science (Nano-Optoelectronics)

RESEARCH MODE FIELDS

PhD and MSc in Optoelectronics

FIELD CODE	RESEARCH FIELDS
01	<i>Nano Materials Fabrication & Characterization</i> 
02	<i>Nano Materials & Devices</i> 
03	<i>Nano Devices & Packaging</i> 
04	<i>Modelling & Simulation of Nano Optoelectronic Devices</i> 
05	<i>Nano Integrated Systems</i> 
06	<i>Solid State Lighting Solutions</i> 
07	<i>Nano Optics</i> 



MIXED MODE PROGRAMME

Master of Science (Nano-Optoelectronics)

MODE

Mixed mode
70% Research +
30% Coursework

TYPE

Full Time & Part Time

INTAKE

April & October

DURATION

Full time : Min. 2 semesters /
Max. 4 semesters
Part time : Min. 3 semesters /
Max. 6 semesters

SEMESTER

Sem I : September - February
Sem II : March - August

TUITION FEES

Malaysian (MYR)
RM 300 x 40 units = RM 12,000

International (USD)
USD 112 x 40 units = USD 4,480

ONE SEM

=

14 weeks (T&L) + 1 week
(midsem break) + 1 week
(revision week) + 3 weeks
(Final Examination)

PROGRAMME STRUCTURE

Master of Science
(Nano-Optoelectronics)
-Mixed Mode

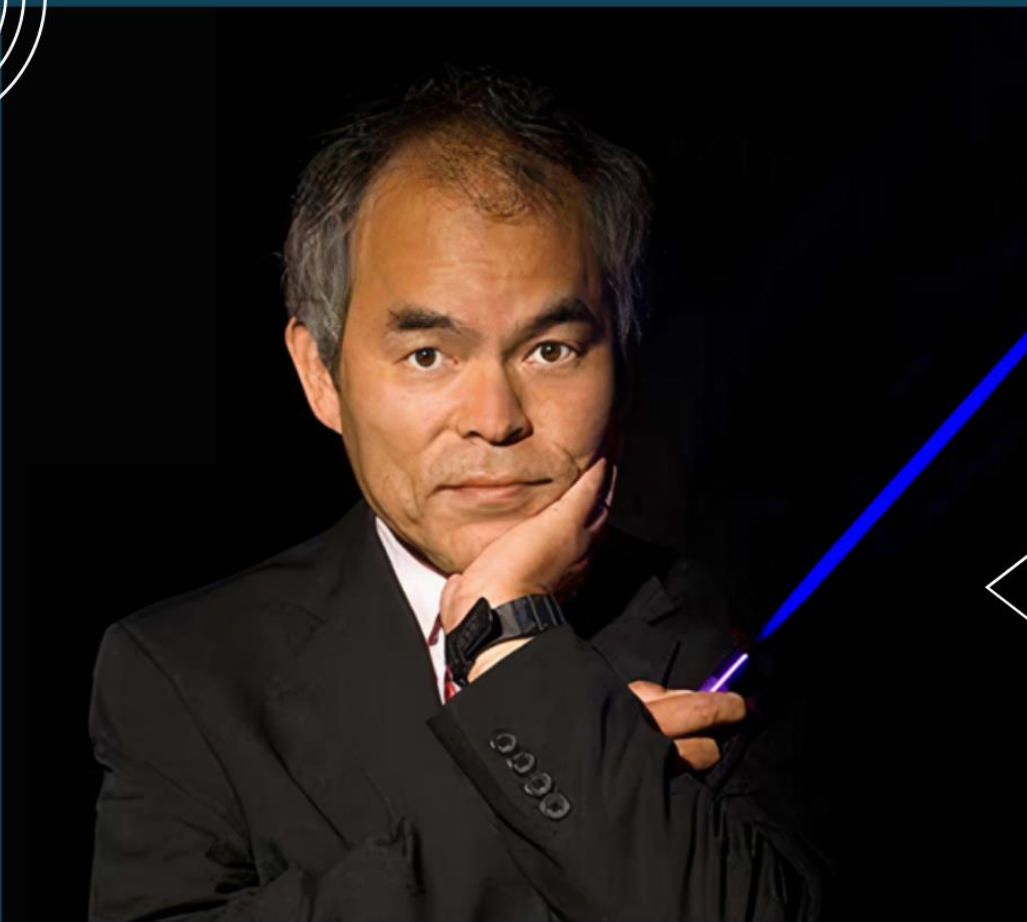
40 units of the
following **4 core**
courses and **2**
elective courses

CODE	CORE COURSES
INT501/4	<i>Physics and Technology of Nanomaterials</i>
INT502/4	<i>Growth and Fabrication of Optoelectronic Devices</i>
INT505/8	<i>Dissertation I</i>
INT506/20	<i>Dissertation II</i>
CODE	ELECTIVE COURSES (Choose ONE only)
INE503/4	<i>Advanced Growth Technology</i>
INE504/4	<i>Advanced Optoelectronics</i>

INOR

NATIONAL PROJECT

GaN on GaN Project



Prof. Dr. Shuji Nakamura
2014 Nobel Prize Laureate in Physics



GaN on GaN PROJECT

LED Technology Transfer Programme from USA to Malaysia



- National LED technology transfer programme from United States to Malaysia.
- EPU budget RM 75 million.
- High impact publication with Noble Laureate winner, Prof. Dr. Shuji Nakamura, University of California Santa Barbara, US.
- Malaysia will be at the forefront of new technologies, namely, GaN on GaN LED technology.

GaN on GaN PROJECT

Involving collaboration between academia,
government, industries and users



XIAMEN UNIVERSITY MALAYSIA
廈門大學 馬來西亞分校

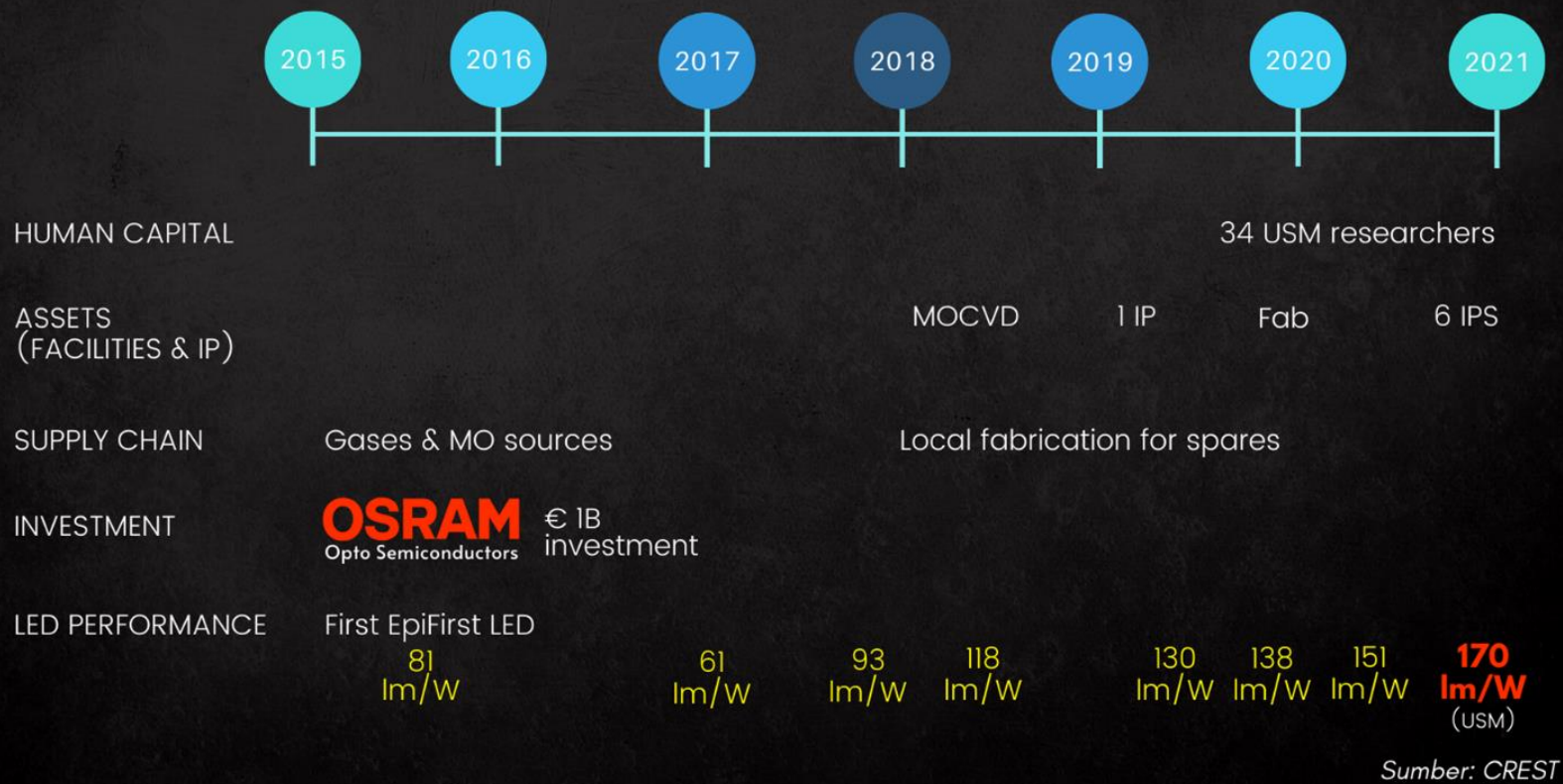


UNIVERSITI
MALAYA
KUALA LUMPUR



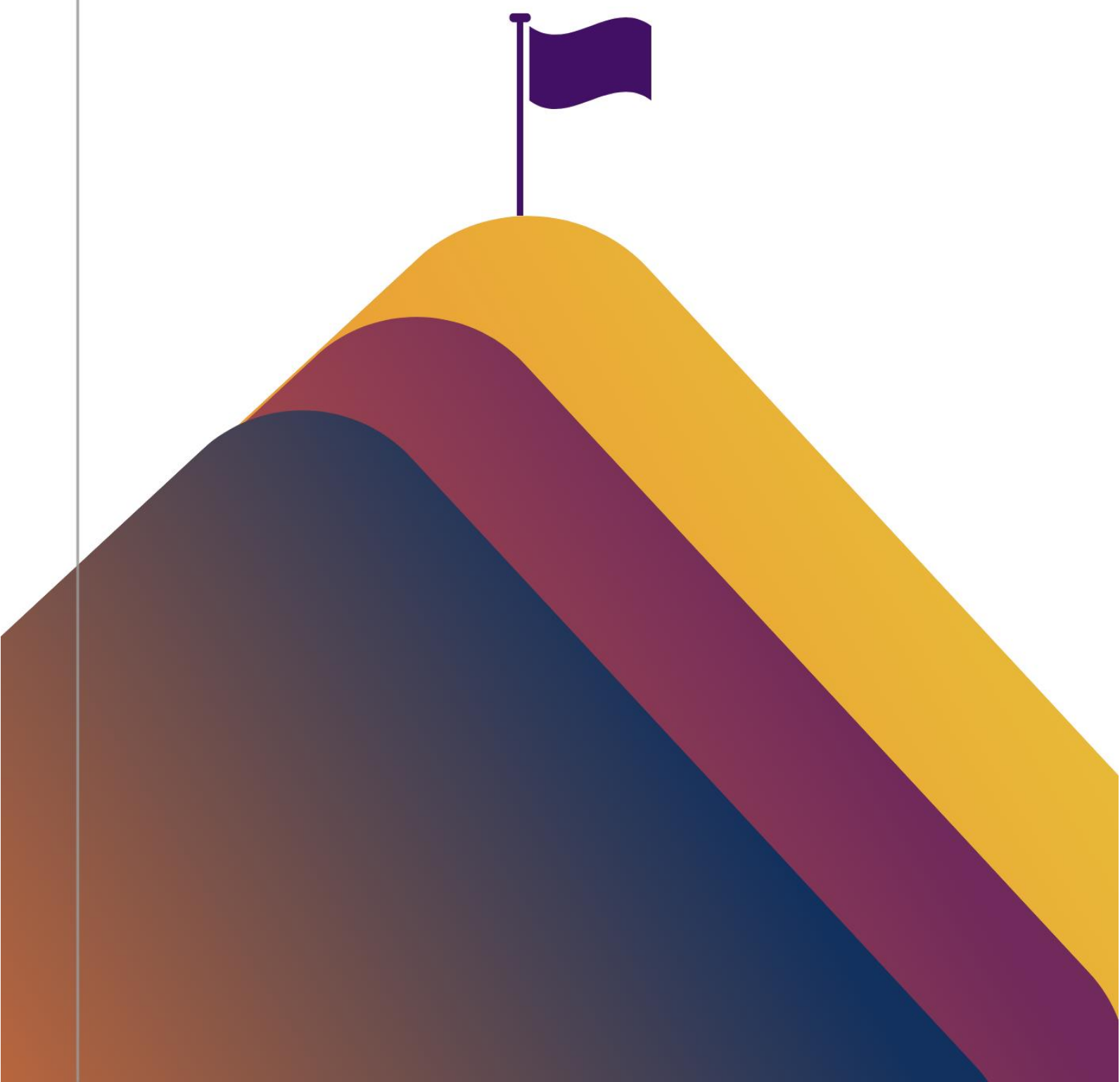
GaN on GaN PROJECT

Achievement & Impact

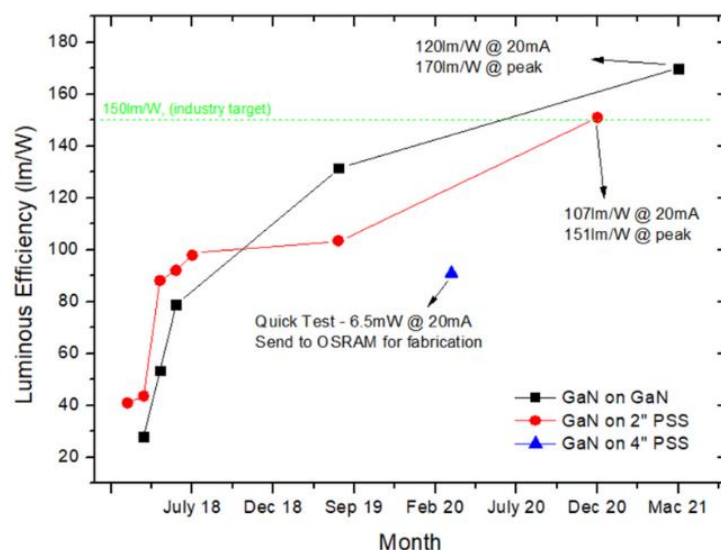
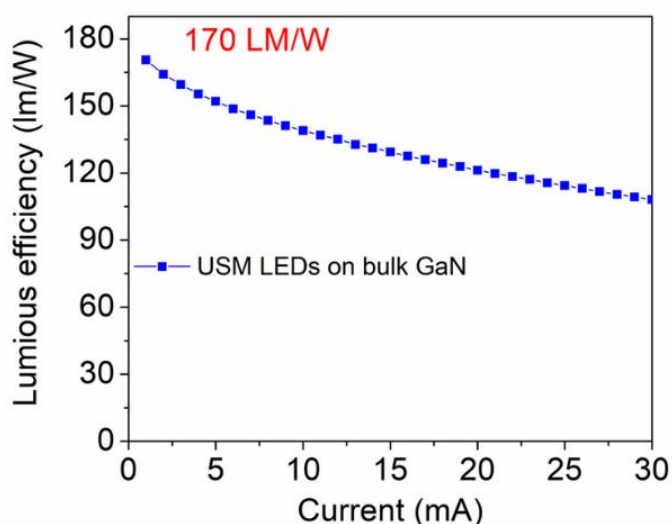


- Talent pipeline for high impact industries & jobs
- World class lab & income generator
- Complete the full supply chain for LEDs in Malaysia
- Foreign/local investment in Malaysia
- Active collaboration between academia and industry
- Equal & better quality

ACHIEVEMENT



GaN ON GaN PROJECT



Peak Luminous Efficiency@ 20mA:

170 lm/W

ACADEMIC & RESEARCH LINKAGES

• Collaboration in publication with top
• researchers of University of California
• Santa Barbara (UCSB), USA :



Prof. Dr. Shuji
Nakamura



Prof. Dr.
James Speck



Prof. Dr. Steven
Denbaars

ACADEMIC & RESEARCH LINKAGES

**INOR
+
ITRAMAS**

Dr. Lim Way Foong,
INOR has been
appointed as
Consultant of
Product Research
and Development at
ITRAMAS



ACADEMIC & RESEARCH LINKAGES

INOR
+
CREST

CREST works as mediator between university and government agencies/industries



ACADEMIC & RESEARCH LINKAGES



2016

Assoc. Prof. Dr. Norzaini Zainal / Mr. Mohd Anas Ahmad

Research training for GaN on GaN project
University of California Santa Barbara, USA

2018

Assoc. Prof. Dr. Ng Sha Shiong

Research training for GaN on GaN project
University of California Santa Barbara, USA



2019

Dr. Lim Way Foong

Visiting Professor
Universite De Lorraine, France

ACADEMIC & RESEARCH LINKAGES



2020

Ms. Nur Atiqah Hamzah

Research training for GaN on GaN project
University of California Santa Barbara, USA

2020

Mrs. Rahil Izzati Mohd Asri

Research training for GaN on GaN project
University of California Santa Barbara, USA



2020

Assoc. Prof. Dr. Norzaini Zainal

Research attachment
University Technology of Graz, Austria



ACADEMIC & RESEARCH LINKAGES



2021

Assoc. Prof. Dr. Norzaini Zainal
Research attachment
Ferdinand-Braun-Institut, Germany

2020-2021

Mr. Ahmad Sauffi Yusof
Co-Tutelle programme
Universite De Lorraine, France



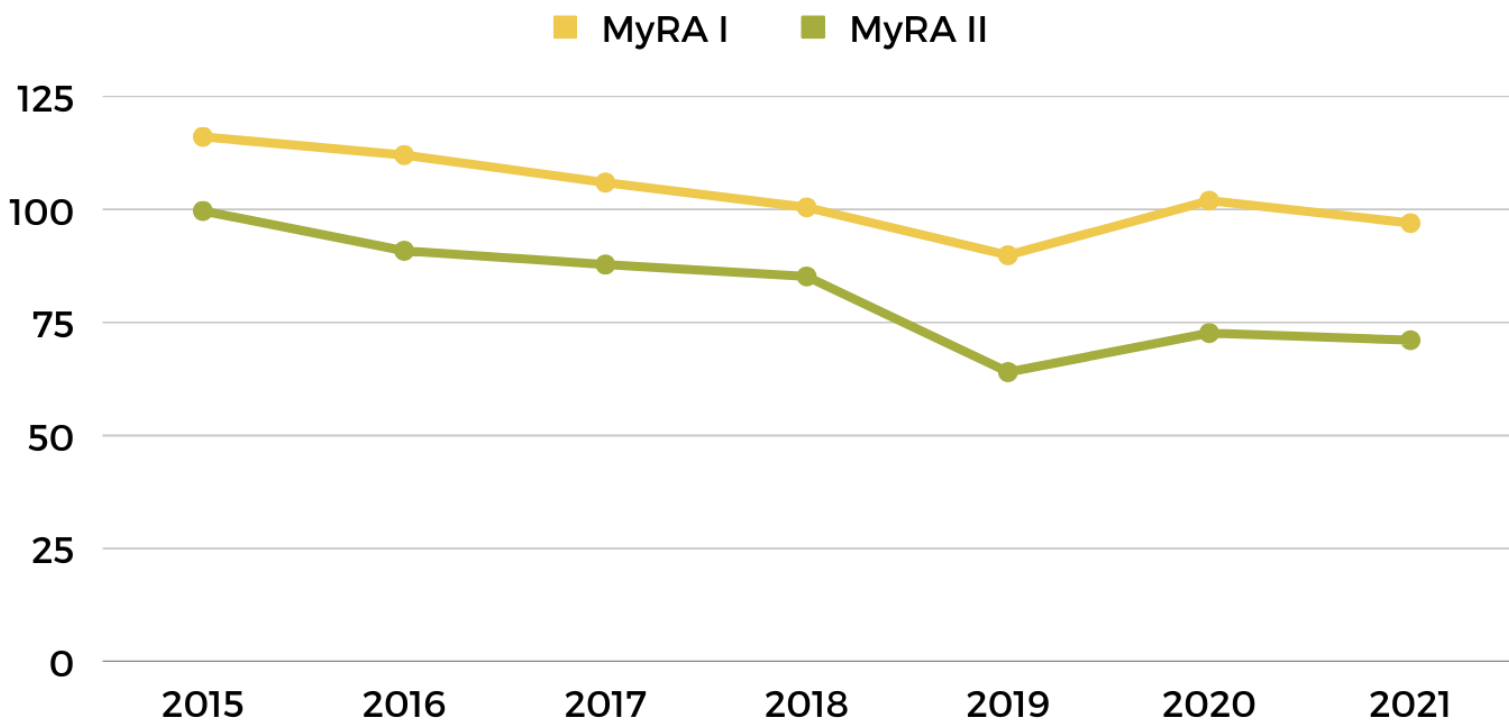
2015 - 2021

INOR KPI TRENDS

Malaysia Research
Assessment (MyRA)

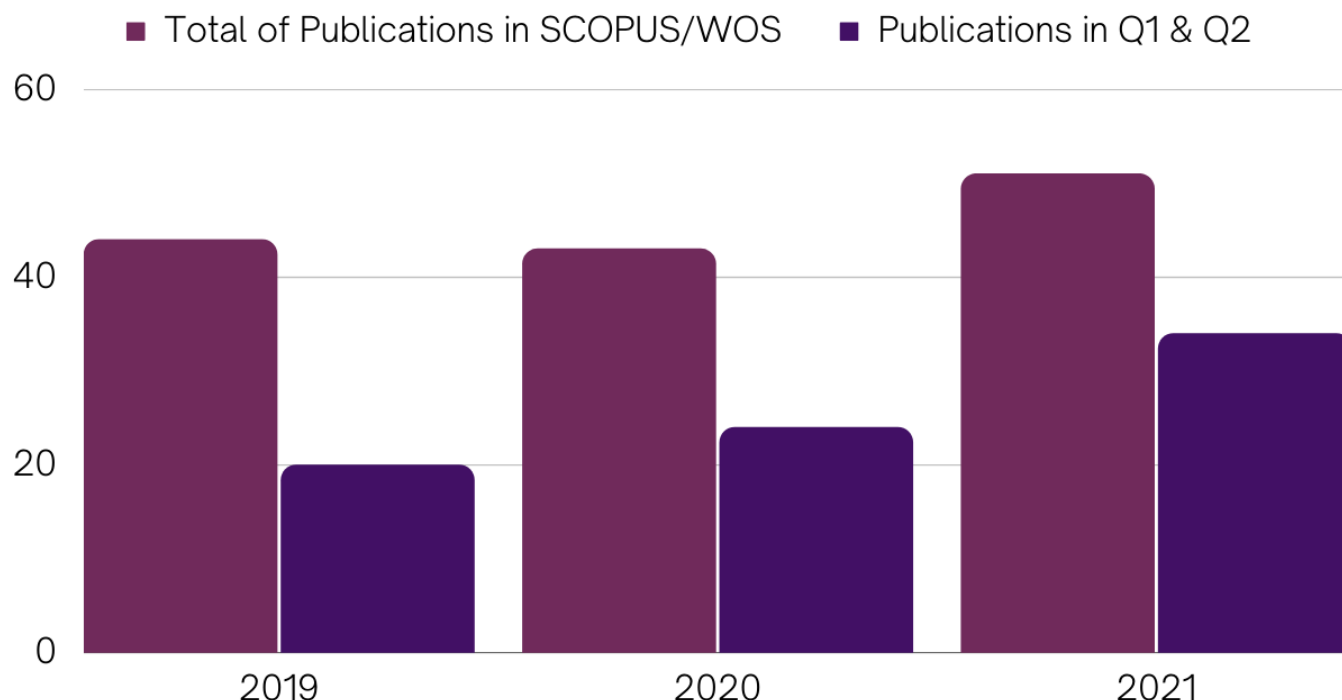
TOP 1

INOR ranked Top 1 among other departments in year 2015, 2016 and 2018 for MyRA I while for MyRA II in year 2015 and 2016.



PUBLICATIONS AND CITATIONS

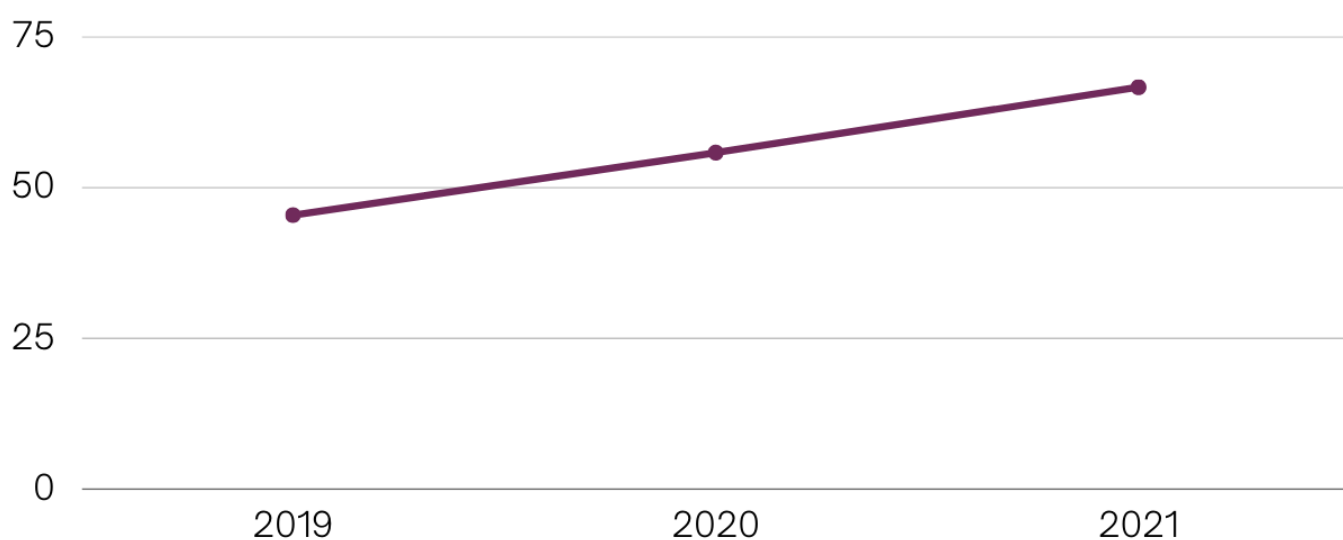
- Publications in SCOPUS /WOS Indexed Journal



66.67%

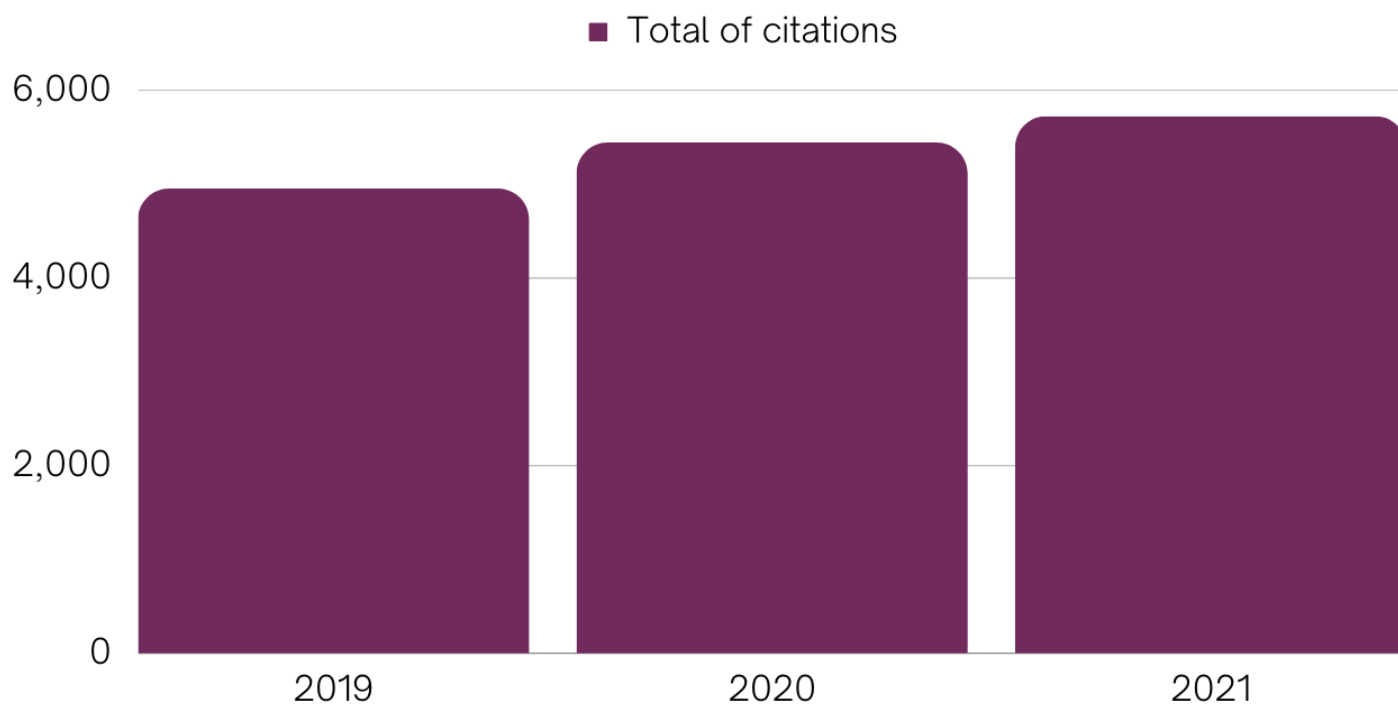
Percentage of Q1 and Q2
papers from total
publications in SCOPUS/WOS
Journals

■ Percentage of Q1 and Q2



PUBLICATIONS AND CITATIONS

- Accumulative citations in the publication



5717

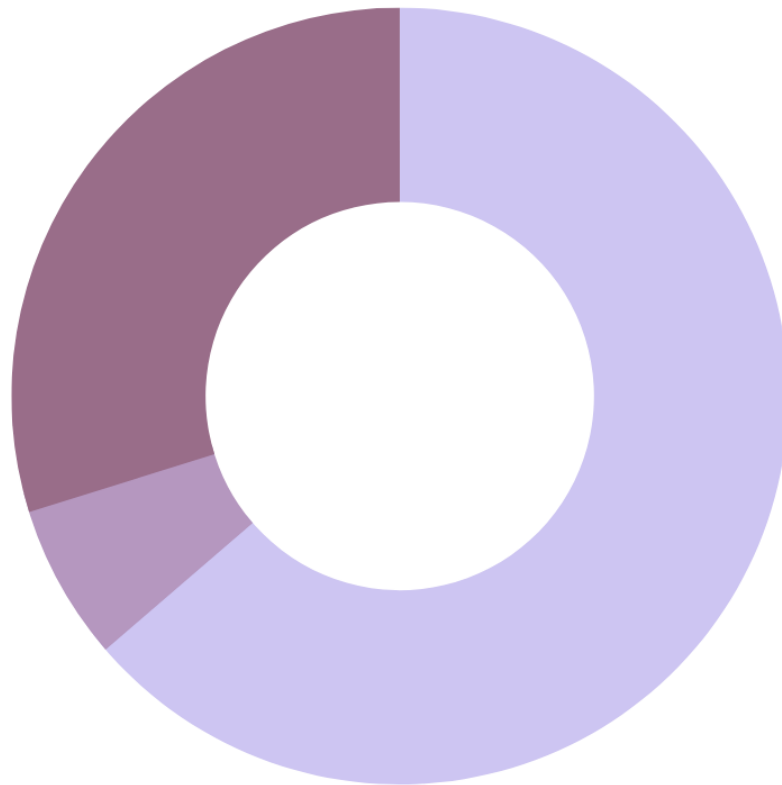
The highest total of citations
in the past 6 years (2016-2021)

RESEARCH GRANTS

Active grants (2016-2021)



Industry
RM 1.93M



National
RM 4.12M

International
RM 0.42M

NATIONAL

INTERNATIONAL

INDUSTRY

8
2
1
1

FRGS
Science Fund
LRGS
PRGS



3
1
1
1

NSG Fund
Hibiscus
AUN/SEED-net
Cygnet



1
1
1
1

Biogenes
LOREAL
Malaysia
EPU Fund

AWARDS & RECOGNITIONS



Prof. Dr. Zainuriah Hassan, FASc

“2019 Ohio University Notable Alumni Award”



Dr. Lim Way Foong

**“Loreal-UNESCO
National Fellowship
2019”**



INOR ACTIVE STUDENTS

2019-2021



2021



2020



2019



Active students
based on
programme

 MSc

 PhD

2021



2020



2019



INOR ACTIVE STUDENTS

2019-2021

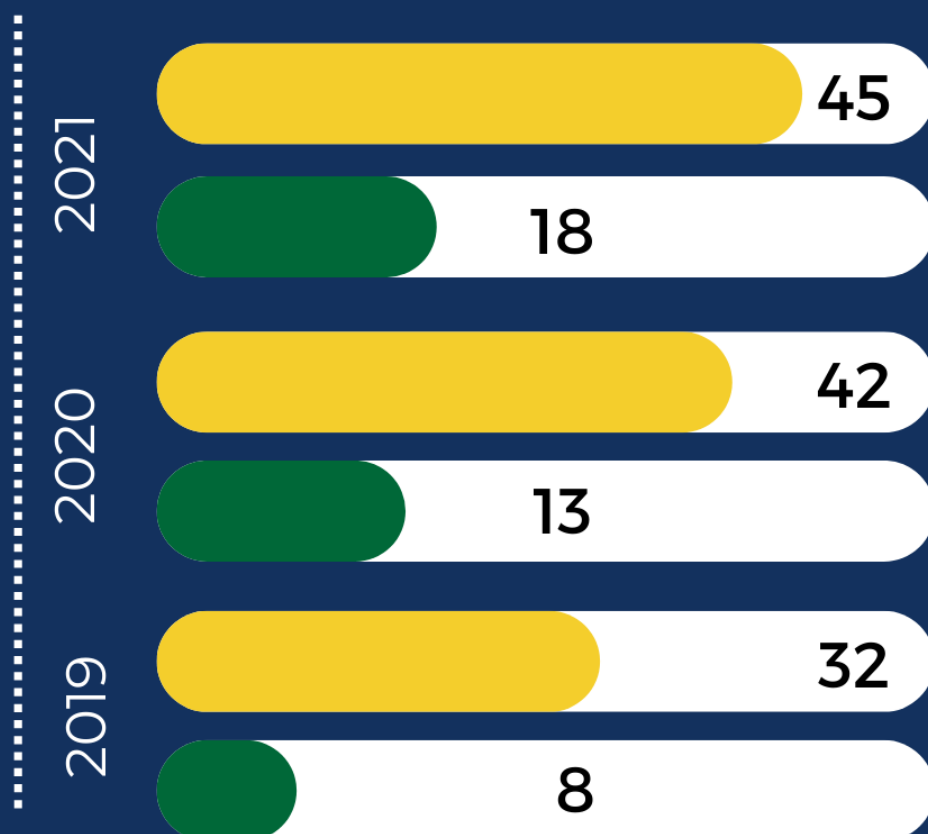
Students enrollment
based on nationality



Local



International



Top countries of international
students



Iraq



China



Pakistan



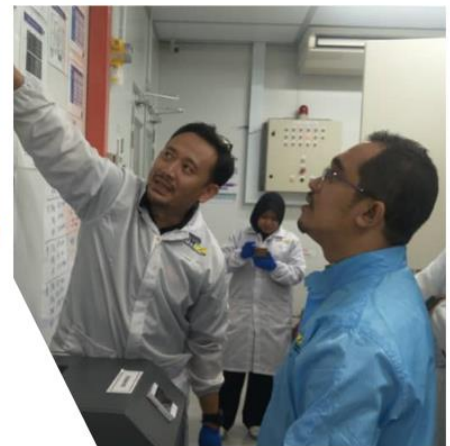
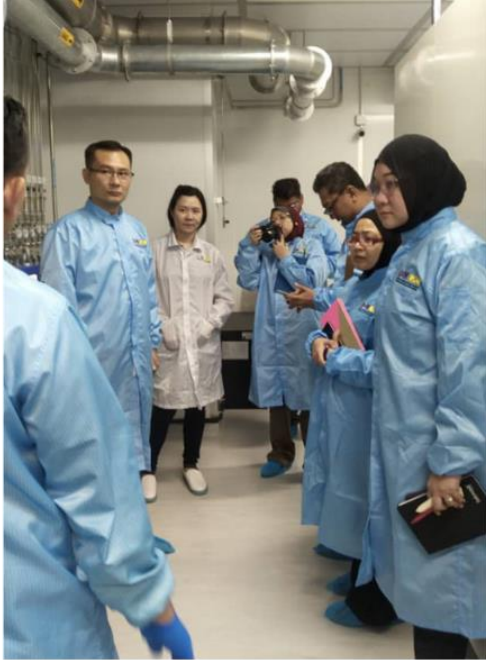
India



GALLERY

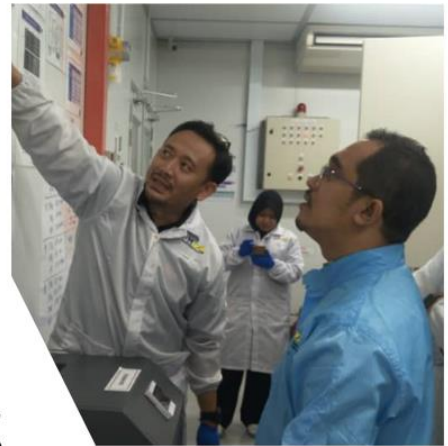
2019-2021





INOR VISITORS





INOR VISITORS





ACTIVITIES



EDITORIAL BOARD

ADVISOR

Assoc. Prof. Ts. Dr. Mohd Zamir Pakhuruddin

EDITORS

Assoc. Prof. Dr. Ng Sha Shiong
Dr. Mundzir Abdullah

GRAPHIC & CONCEPT DESIGN

Mrs. Nur Afiqah Md Rejab

MEMBERS

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Mr. Wan Rosdan Rozali
Mrs. Rahil Izzati Mohd Asri
Ms. Nur Atiqah Hamzah
Mr. Syed Mohamad Syed Sahil
Mrs. Rahmawatini Abd Rahman

INSTITUTE OF NANO OPTOELECTRONICS RESEARCH AND TECHNOLOGY (INOR)

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