

In the Name of Allah, the Merciful, the Beneficent

Development of GO-BNQD Nanohybrid for Dual Cancer Diagnosis and Therapy

Group Members:

Shahid Hussain (394966)

Sundus Sharif (394007)

Supervised by:

Dr. Faheem Amin

Associate Professor

Physics, SNS, NUST

Department of Physics ,School of Natural Sciences

National University of Sciences and Technology (NUST), Sector H-12 Islamabad

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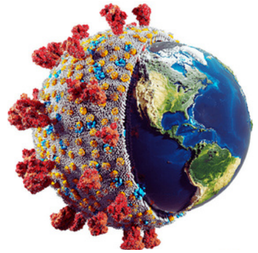
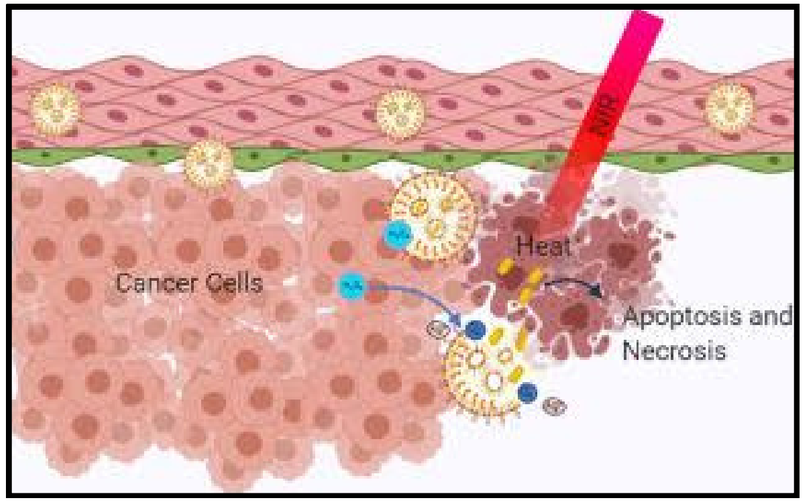
Problem Identification



- What is Cancer ?
- Cancer remains one of the leading causes of death globally(WHO).
- Current cancer therapies suffer from:

  Toxicity , Poor targeting , Inefficient drug delivery



- Chemotherapy: weak immune system, damage to organs , hair loss
- Radiation therapy: Damage to healthy tissues



Need for Solution

01

Develop a material having:

Biocompatibility Low-toxicity Multi-functionality

02

Selective tumor targeting

03

Enhance diagnostic efficiency through optical properties

Proposed Solution

A Graphene Oxide–BNQDs Nanocomposite that:

- Provides efficient drug loading & controlled release
- Improves boron delivery in NCT
- Enhances imaging with strong opticalproperties

10B + n→7Li + 4He + gamma rays

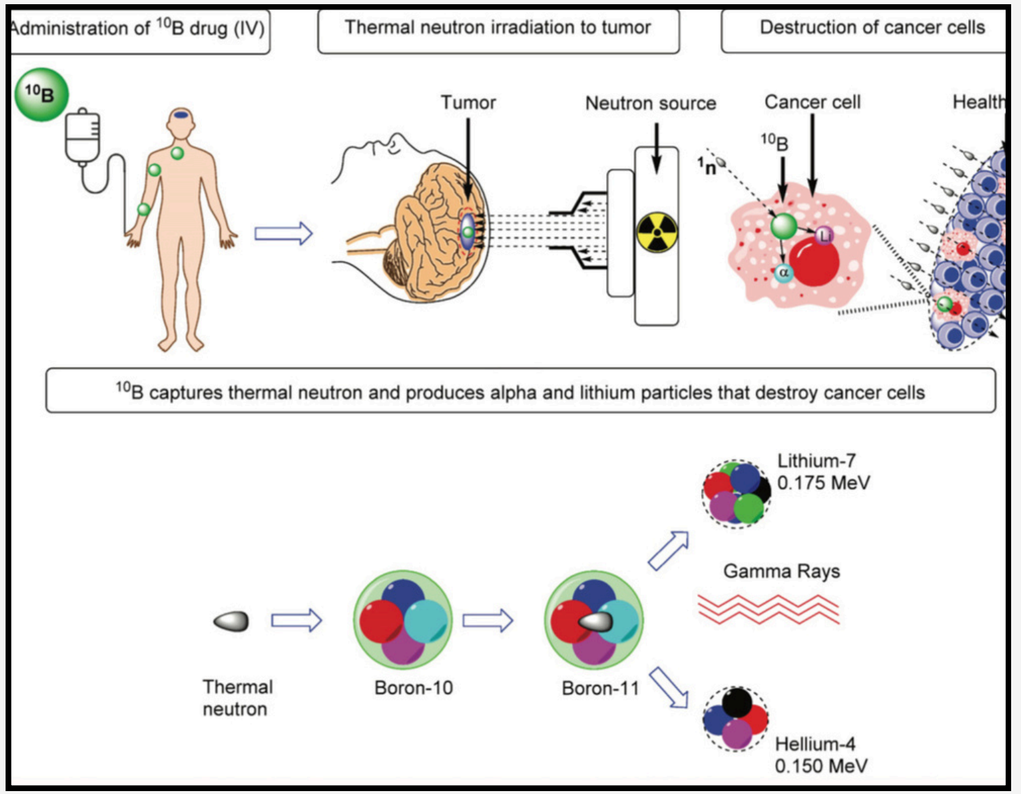


Fig: Delivery of boron to cancerous cells and then neutron beam irradiation

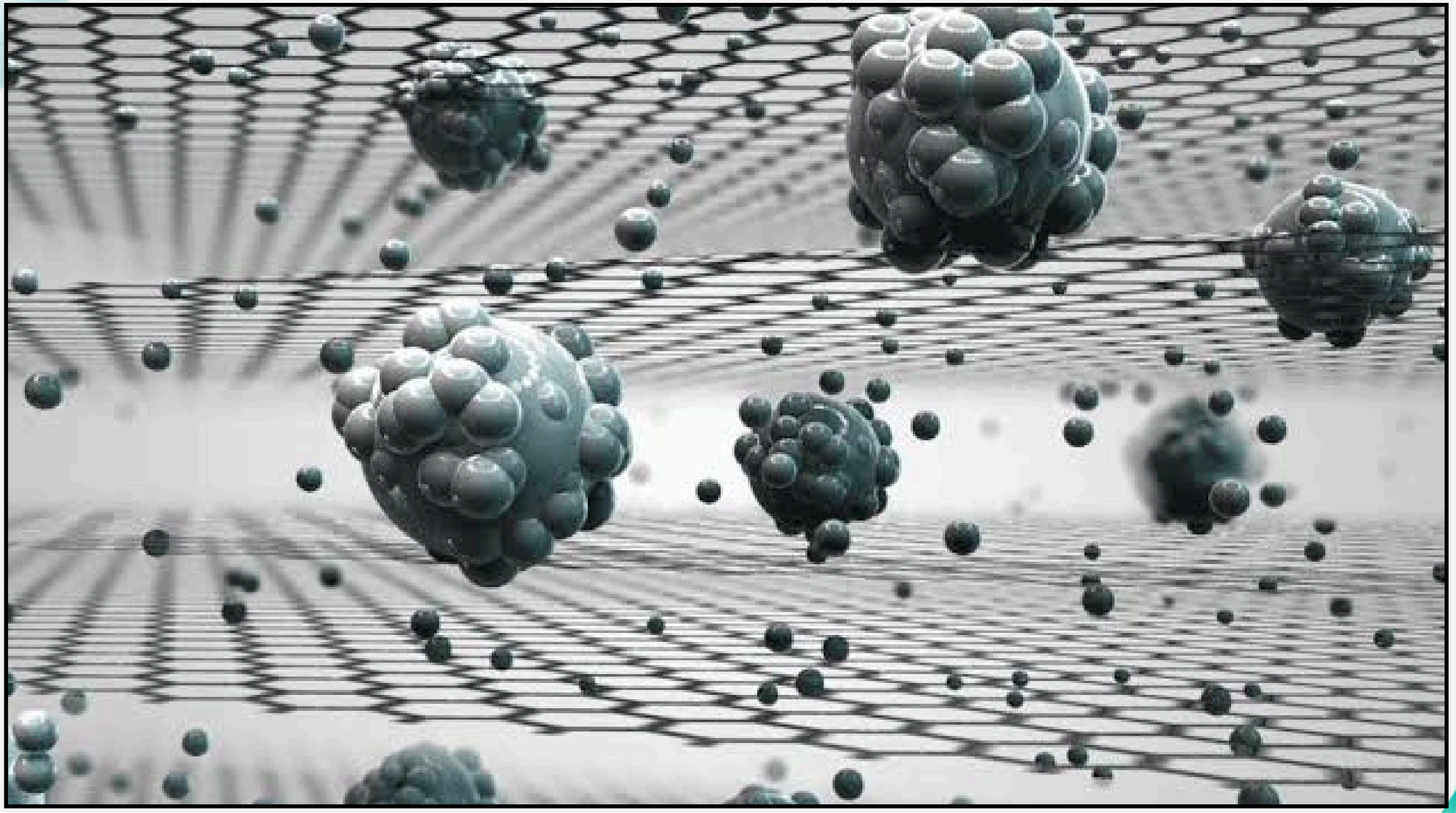


Fig: Working of Graphene Oxide

Technical Working

(Hydrothermal Synthesis)



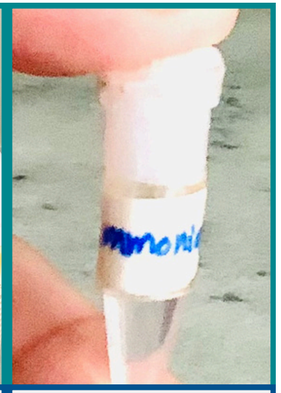
Boric Acid
(0.1g)



Melamine
(0.0339g)



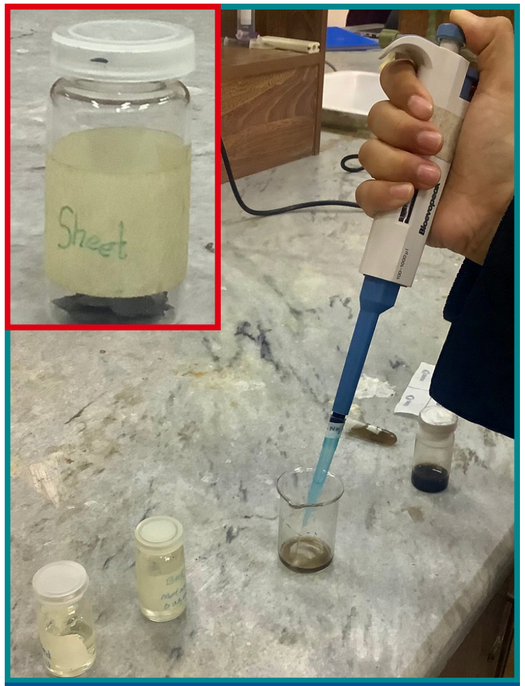
Boric Acid
(0.1g)



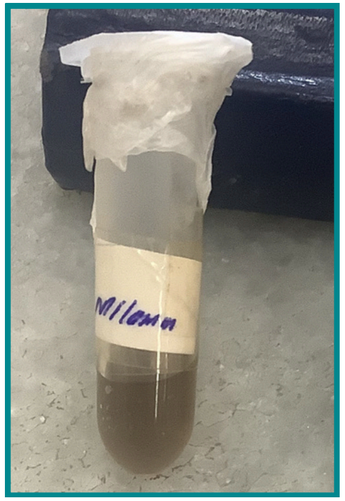
Ammonia
(0.8ml)

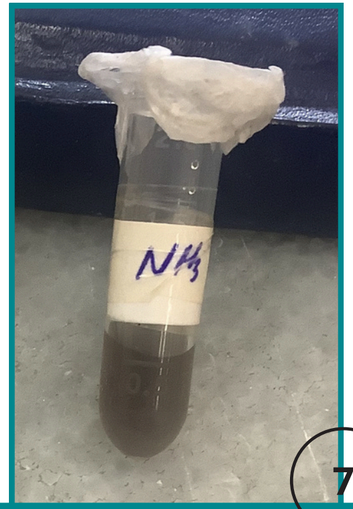


BNQDs (Hydrothermal Process)



Graphene Oxide
(1mg/ml)





Characterisations

UV Spectroscopy

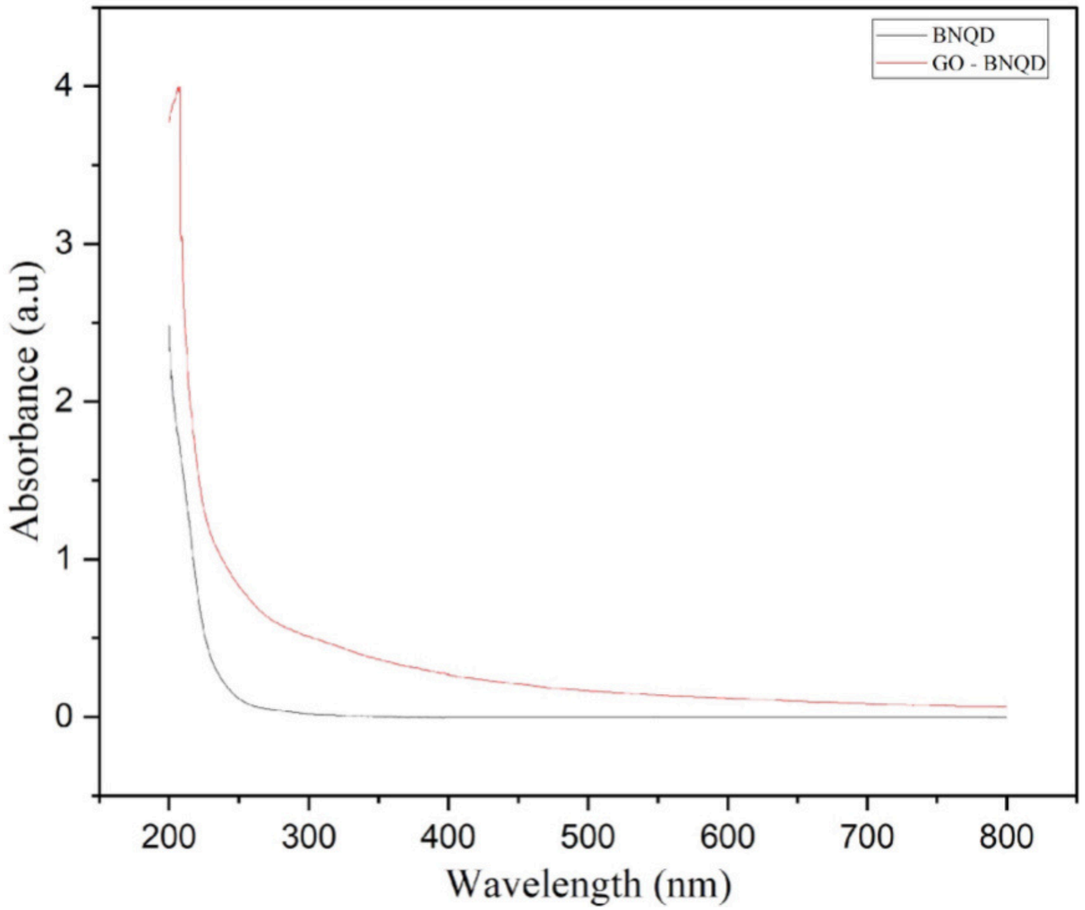
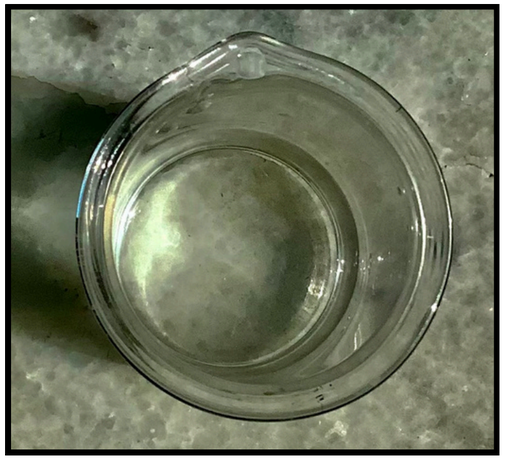
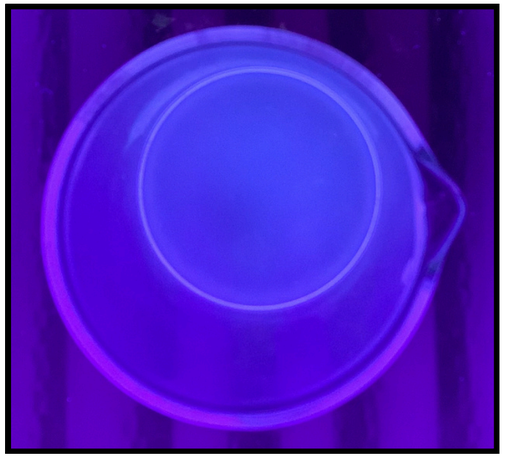


Fig: UV-Vis Spectrum of BNQDs and BNQDs-GO composite

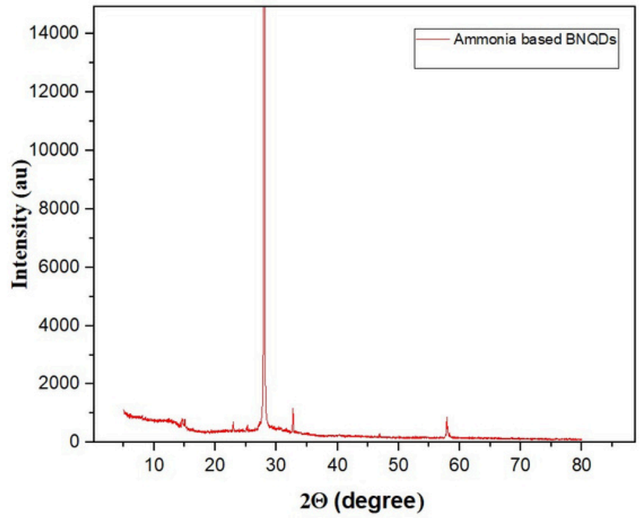
Fluorescence

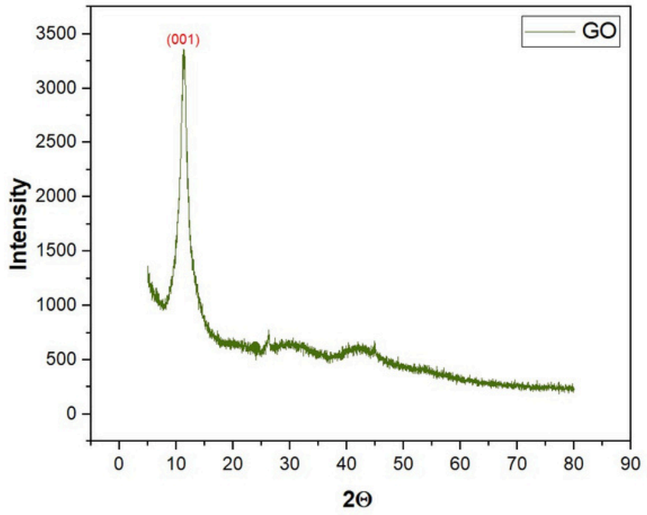


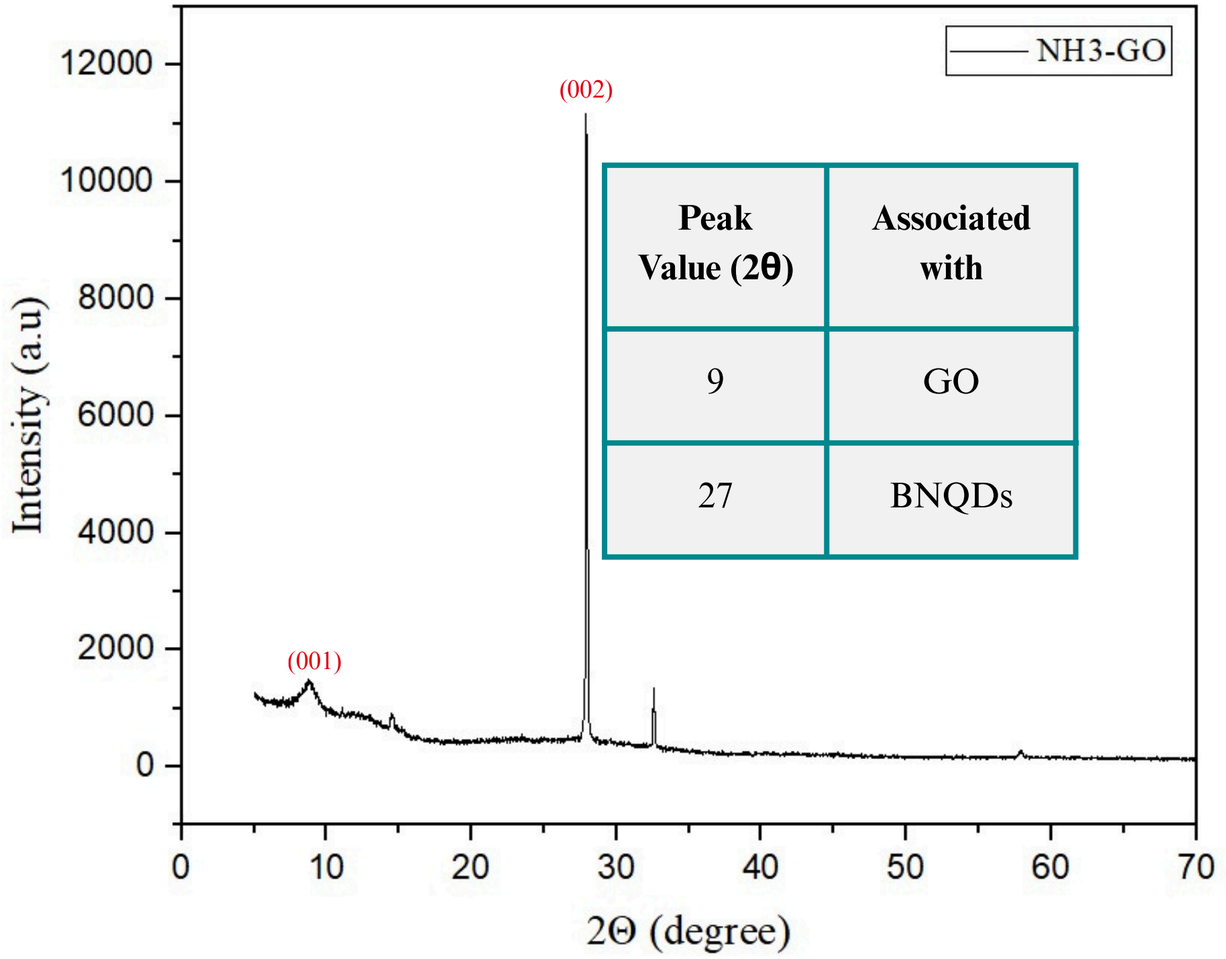


Characterizations

X-Ray Diffraction







Peak Value (2θ)	Associated with
9	GO
27	BNQDs

Fig: XRD spectrum of NH3 based BNQDs-GO composite

Characterizations

Raman Spectroscopy

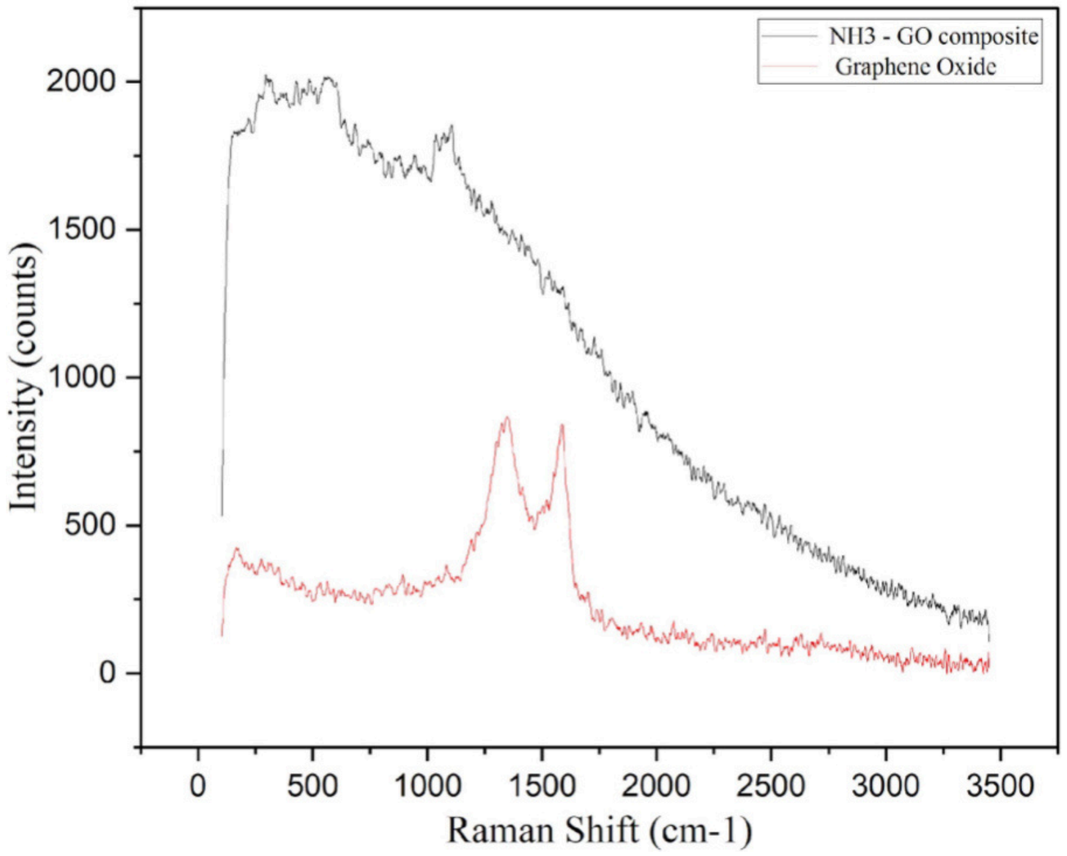


Fig: Raman Spectroscopy of Graphene sheets and NH3 based BNQDs-GO composite

Peak Value (cm–1)	Associated with
1350	D-band
1580	G-band
1366	B-N (stretching)

Characterizations

Fourier Transform Infrared Spectroscopy (FTIR)

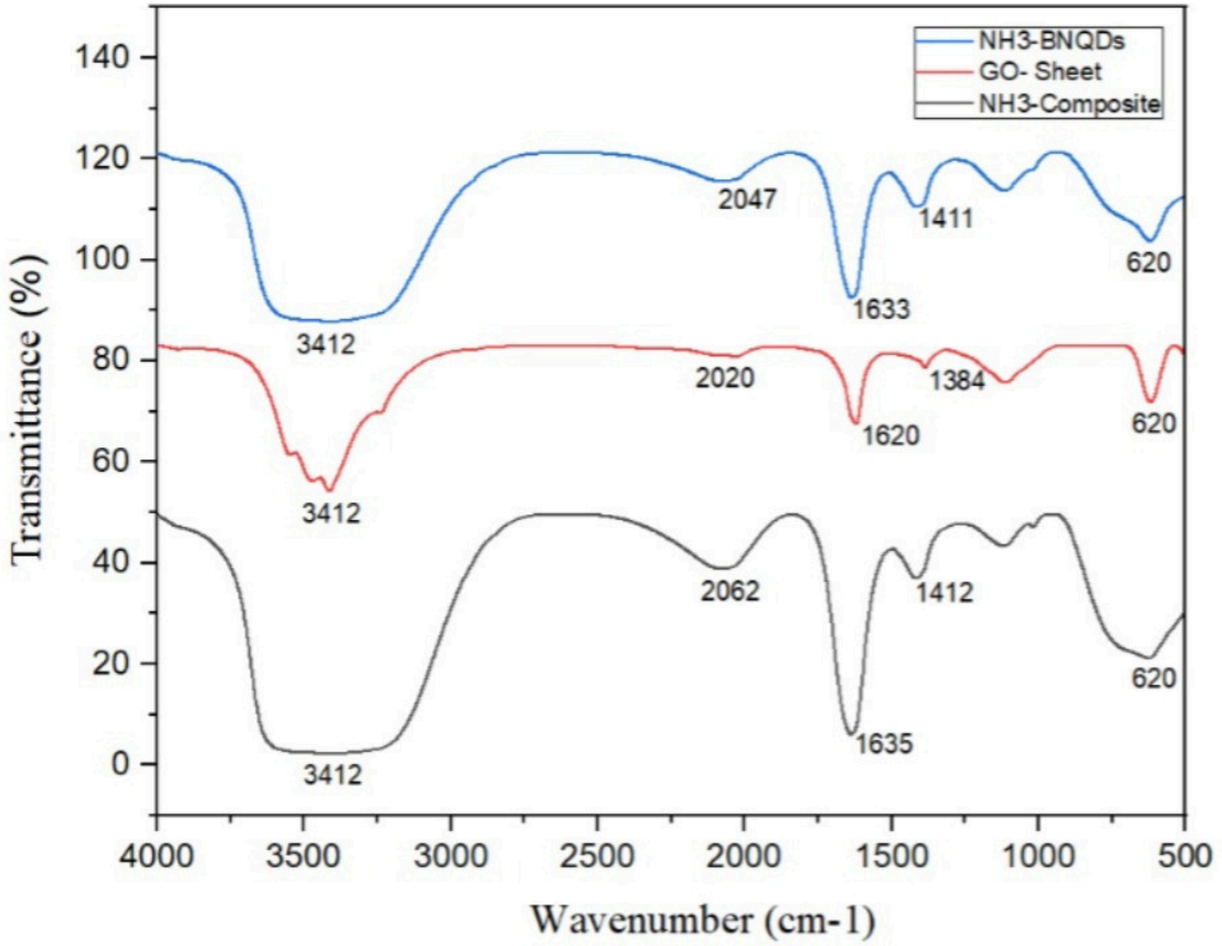


Fig: FTIR peaks of NH3 based BNQDs, GO sheets and BNQDs-GO composite

Peak Value (cm–1)	Type of Bond
3400	O-H (Stretching)
1630	N-H (Bending)
1384	B-N (Stretching)
600-800	B-N-B (Stretching , aromatic ring)

Characterizations

Scanning Electron Microscope (SEM)

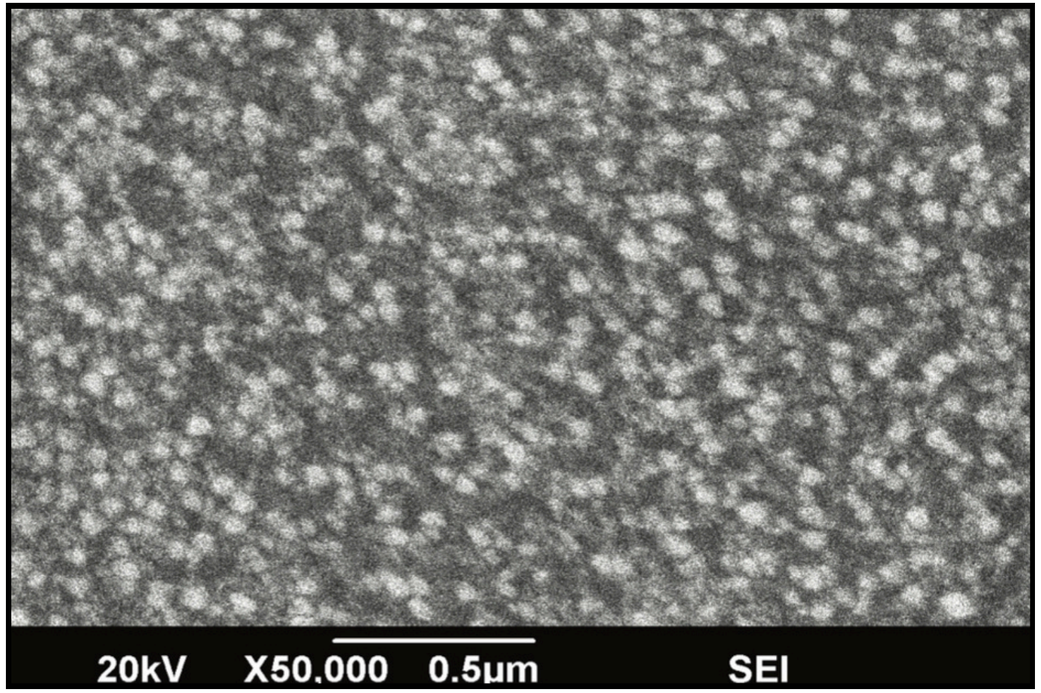


Fig: SEM images showing the surface morphology of BNQDs

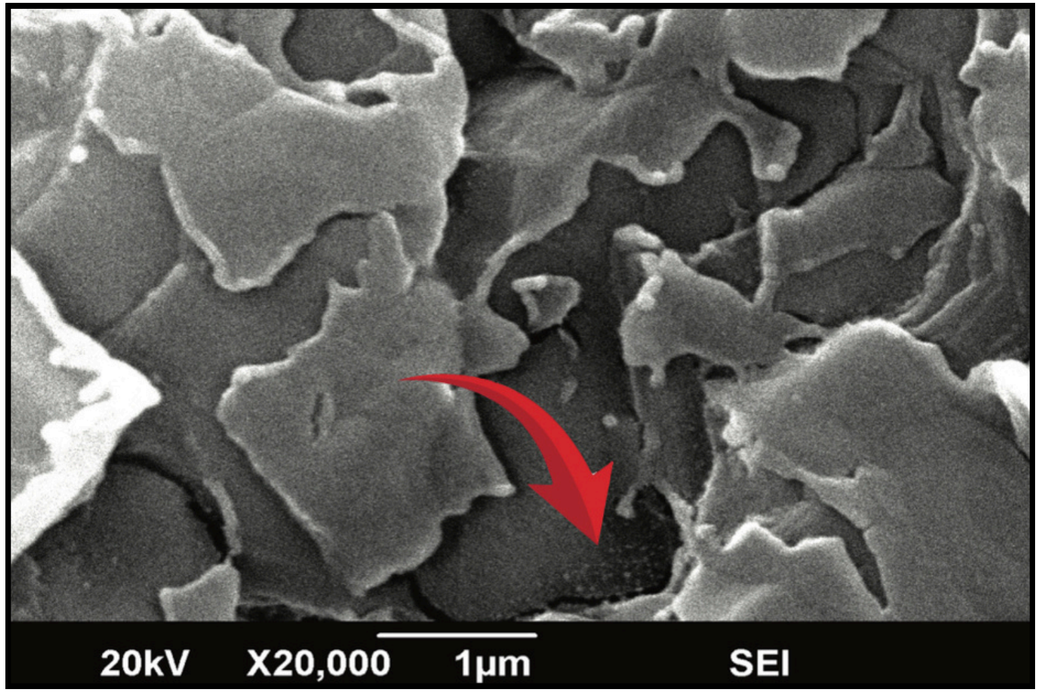


Fig: SEM images showing the surface morphology of composite of BNQDs-GO

Novelity

Theranostic

Combines cancer diagnosis and therapy

Enhanced boron delivery

Optimized for Neutron Capture Therapy

Controlled drug release

Supports targeted treatment





Efficient imaging

Strong optical response

Biocompatible & Non-toxic

Safer than traditional agents

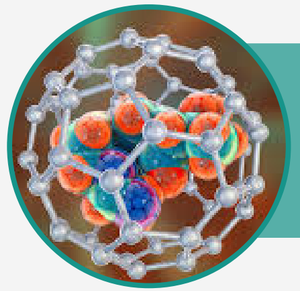
Edge over competitors

Multifunctional and cost-effective

FUTURE GOALS

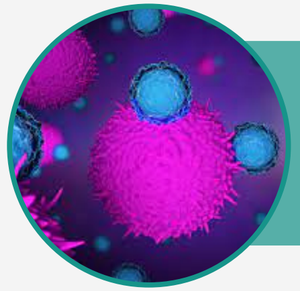
- Drug loading and release
- In-Depth Cytotoxicity and Biocompatibility Tests
- Lab testing of Neutron Capture Therapy from Pakistan Institute of Nuclear Science and Technology (PINSTECH)
- In Vivo and In vitro test

Conclusions



Development of BNQDs

A Noval quantum dot for NCT and bio-imaging



Enhanced Properties

With GO (bioocompatibility, stability, and functional performance for targeted cancer therapy)



70% cheaper, Twice as fast

Costs 50–70% cheaper compared to gold-based composites and reduces patient hospitalization time



Interdisciplinary Value

Biomedical applications, bridging Physics, nanotechnology, and medicine.

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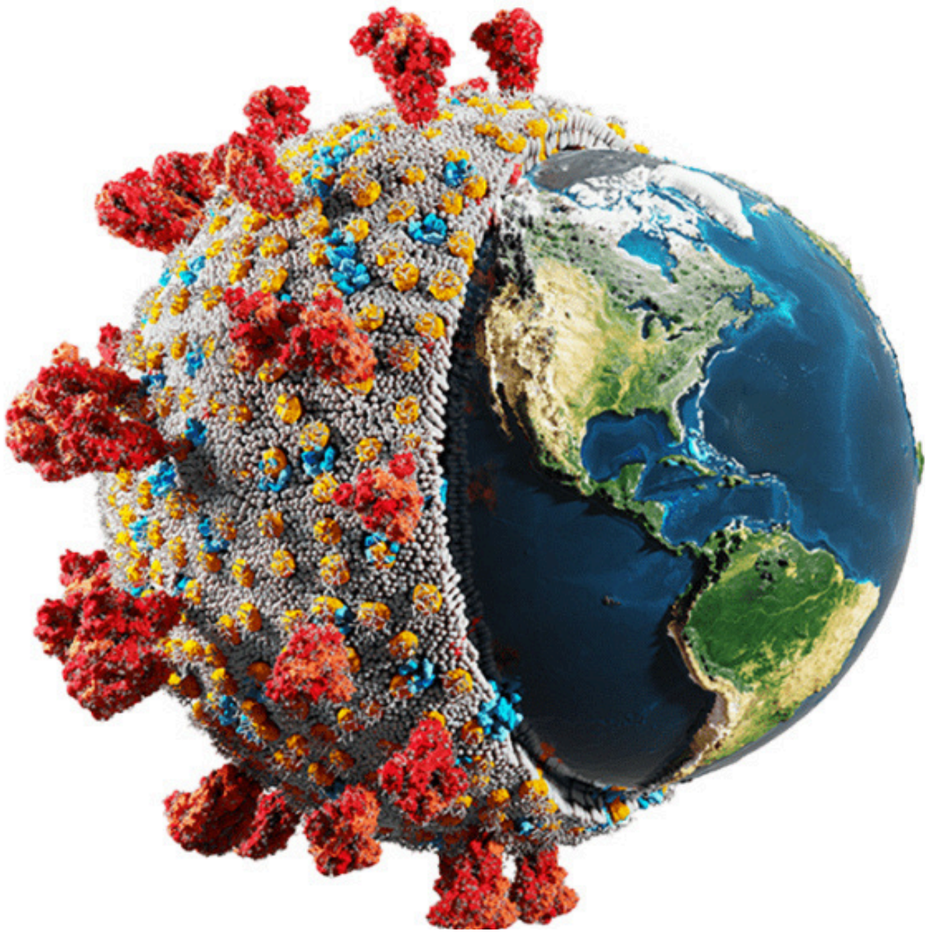

Thank You!