SUPPLEMENTARY INFORMATION

Multimodal Graphene Oxide Nanoplatform Integrating Proteasome Inhibition and Phototherapy for Synergistic Oral Cancer Treatment

Shishira P S[1], Zinataman Sarkar[1], Varshini Are[1], Bhavesha Chanchlani[1], Ankita Ghosh[2], Swati Biswas[1]*

[1]Nanomedicine Research Laboratory, Department of Pharmacy, Birla Institute of Technology & Science-Pilani, Hyderabad Campus, Jawahar Nagar, Medchal, Hyderabad-500078, Telangana, India.

[2]FIIT JEE Junior College, Saifabad, Hyderabad, Telangana-500004, India

*Corresponding author
Swati Biswas, Ph.D.
Professor-Department of Pharmacy
Nanomedicine Research Laboratory
BITS-Pilani, Hyderabad campus
Medchal, Hyderabad-500078
Telangana, India
Email: swati.biswas@hyderabad.bits-pilani.ac.in
Phone: (+91)40-6630-3630
Fax: (+91)40-6630-3998

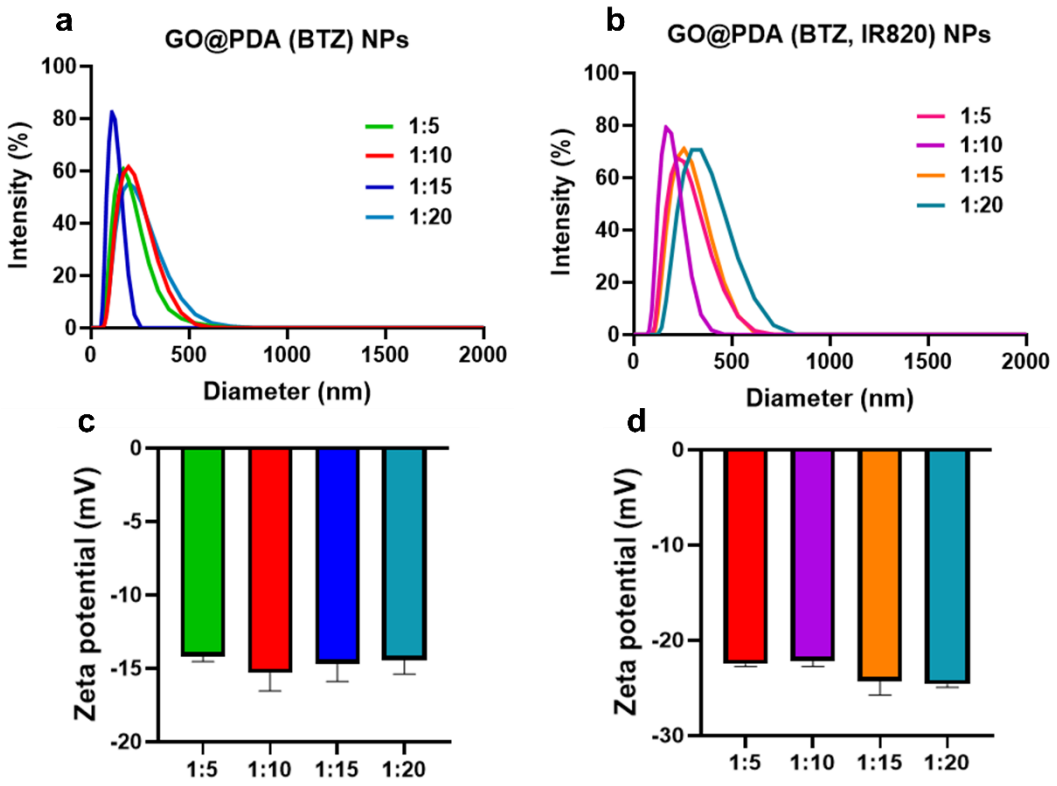


Figure S1: Particle size (**a, b**) and zeta potential (**c, d**) graphs of different ratios (1:5, 1:10, 1:15, and 1:20) of GO@PDA (BTZ) and GO@PDA (BTZ, IR820) NPs.

Table S1: Particle size, zeta potential, PDI, EE%, and DL% of GO@PDA (BTZ) NPs.

BTZ: GO@PDA NPs	**Particle size (nm)**	**Zeta Potential (mV)**	**PDI**	**EE%**	**DL%**
1: 5	161 ± 1.34	-14.2± 0.53	0.13	71.3	11.88
1:10	174 ± 2.32	-15.3± 0.74	0.32	80.12	7.30
1:15	114 ± 1.24	-14.7± 0.91	0.12	89.2	5.45
1:20	194 ± 0.65	-14.46± 1.23	0.15	80.5	3.83

Table S2: Particle size, zeta potential, PDI, EE%, and DL% of GO@PDA (BTZ, IR820) NPs.

IR820: GO@PDA (BTZ)NPs	Particle size (nm)	Zeta Potential (mV)	PDI	EE%	DL%
1: 5	216 ± 1.54	-22.5± 0.92	0.24	65.4	10.9
1:10	172 ± 1.43	-22.2± 0.91	0.32	82.5	7.5
1:15	232 ± 2.41	-24.3± 1.11	0.26	79.3	4.95
1:20	295 ± 1.45	-24.6± 0.53	0.15	73.5	3.5

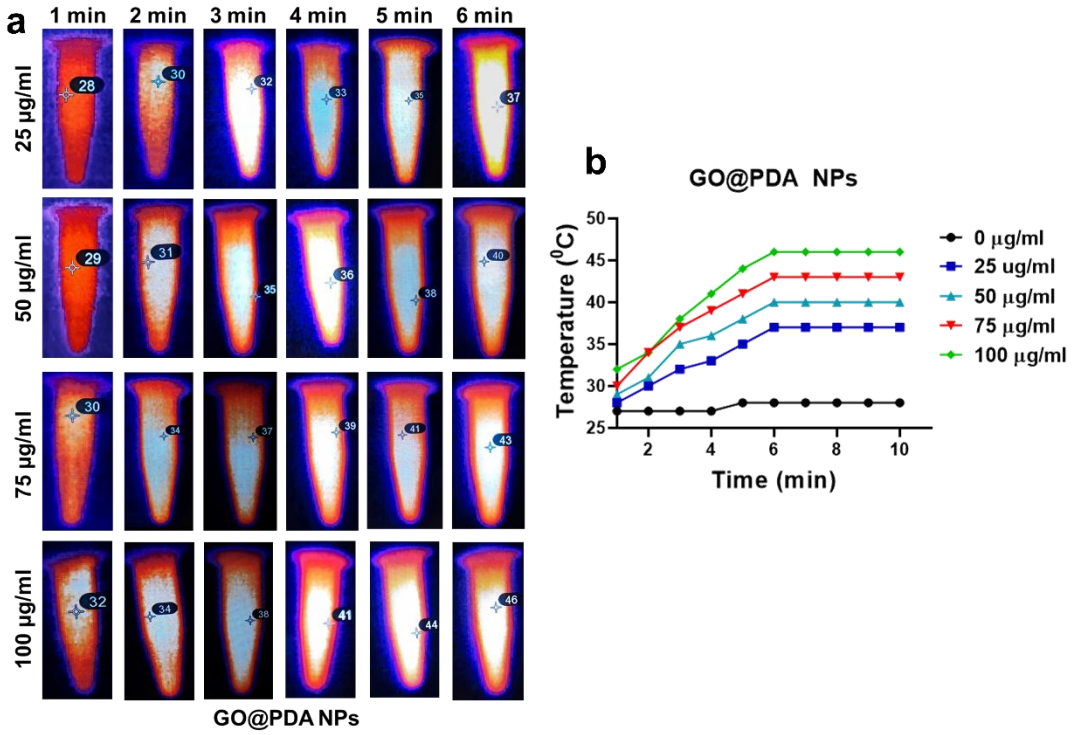


Figure S2: Photothermal effect images **a** of different concentrations of GO@PDA NPs irradiated with 808 nm NIR laser with 1 W/cm^2 laser density. Temperature variation graph **b** of GO@PDA NPs up to 10 mins.

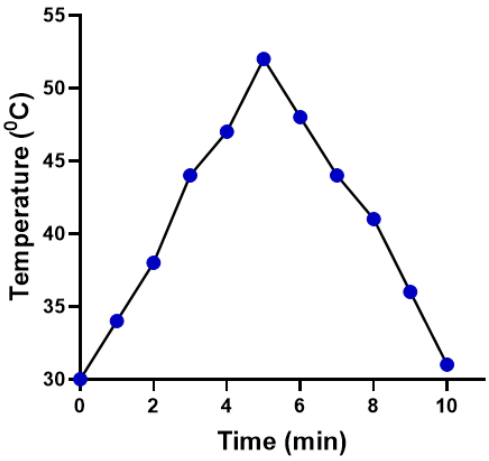


Figure S3: Cooling curve of GO@PDA (BTZ, IR820) NPs with 1.5 W/cm^2 at 808 nm laser.

Photothermal efficiency calculations:

To calculate the photothermal efficiency, the 100 µg/ml solution of GO@PDA (BTZ, IR820) NPs was irradiated with an 808 nm NIR laser / 1W/cm2 laser density, and a cooling curve was plotted (**Figure S3**). The temperature of the surroundings was 28ºC, the temperature of the blank was 30ºC, and the temperature of the NPs increased from 30ºC to 52ºC, respectively, and remained constant. The absorbance of the solution (A_{808}) = 0.9. The linear equation was obtained from the cooling curve: -0.0027x + 0.275, and further hS was calculated using the equation.

hS = -Slope × mass of the water (m) × specific heat capacity of water (C)
hS = -0.0027 × (1.5 g) × 4.18 J/g ºC
hS = 0.169 W/ºC

Q_{dis} = hS ($T_{M\ of\ blank}$ – T_E)
Q_{dis} = 0.169 W/ºC (30ºC - 28ºC)
Q_{dis} = 0.0338 W

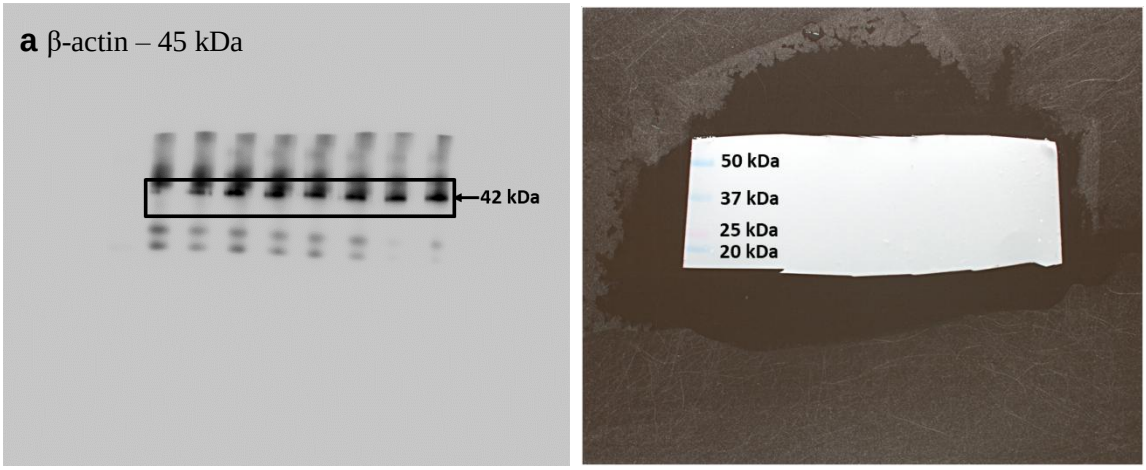
I = Laser density used × surface area of the tube used
I = (1 W/cm^2) × π × (0.5 cm)^2
I = 0.785 W

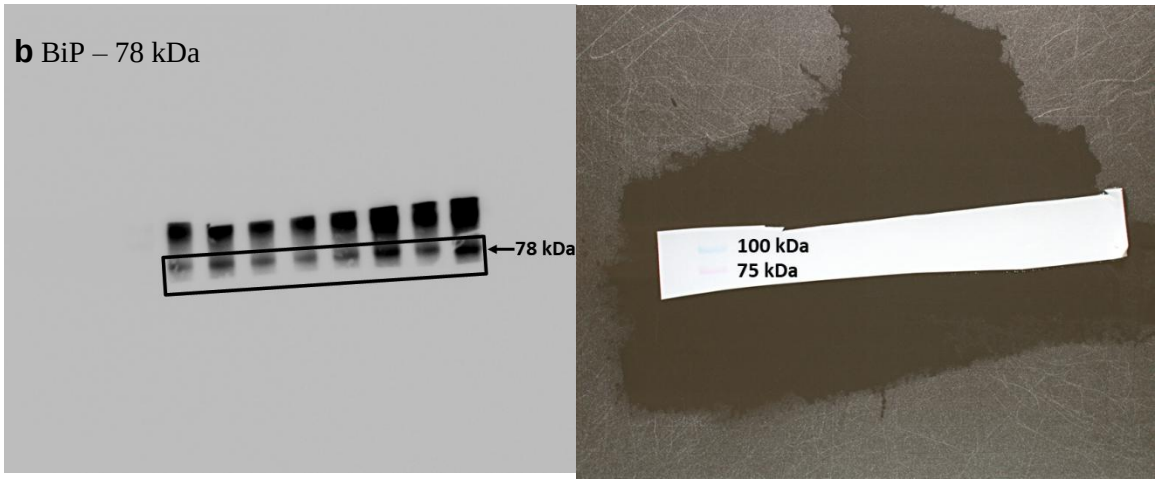
$$\eta = \frac{\text{hS}\ (T_M - T_E) - Q_{dis}}{I\ (1-10^{-A_{808}})} \times 100$$

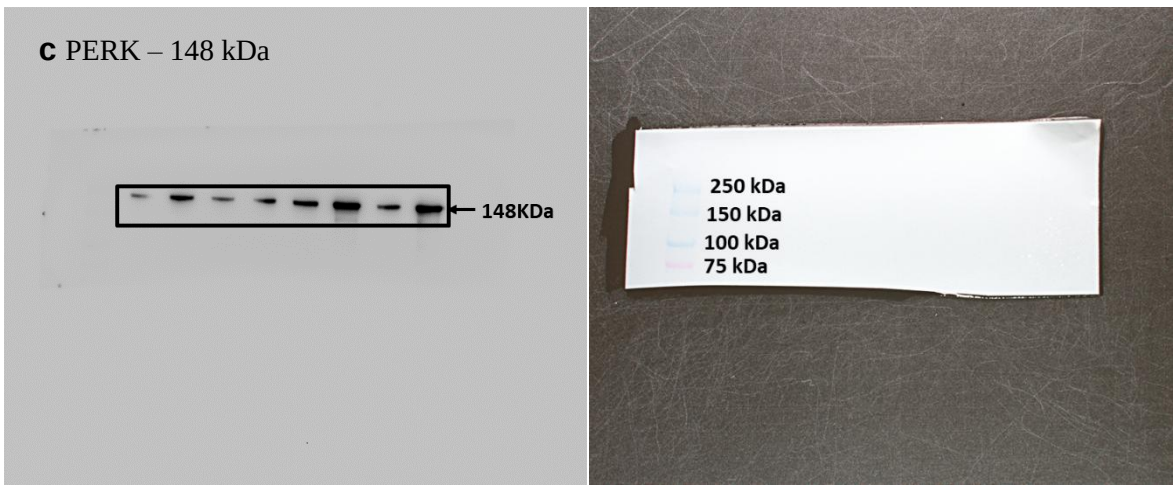
$$\eta = \frac{0.169\ (52-28) - 0.0338}{0.785\ (1-10^{-0.9})} \times 100$$

= 0.5418 × 100
= **54.18 %**

Raw data for Western Blot analysis:







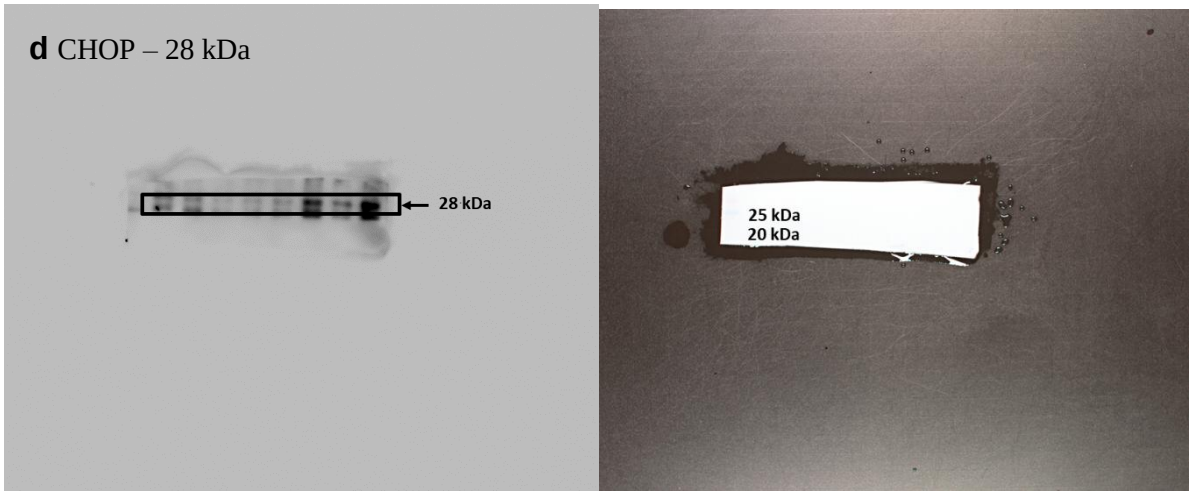


Figure S4: Western blot analysis. Full-length, uncropped Western blot of β-actin, BiP, CHOP, and PERK markers corresponding to **Figure 8b**. The boxed region in the raw figure was cropped from this blot and included in the main **Figure 8b**. The blot was developed under the same exposure conditions for all the markers.