Electronic Supplementary Material (ESI) for Nanoscale.

Graphene Quantum Dot-based FRET System for Nuclear-targeted and Real-time Monitoring of Drug Delivery

Hui Chen, Zhuyuan Wang*, Shenfei Zong, Peng Chen, Dan Zhu, Lei Wu, Yiping Cui*

Advanced Photonics Center, Southeast University, 2# Sipailou, Nanjing 210096, China.

cyp@seu.edu.cn, wangzy@seu.edu.cn

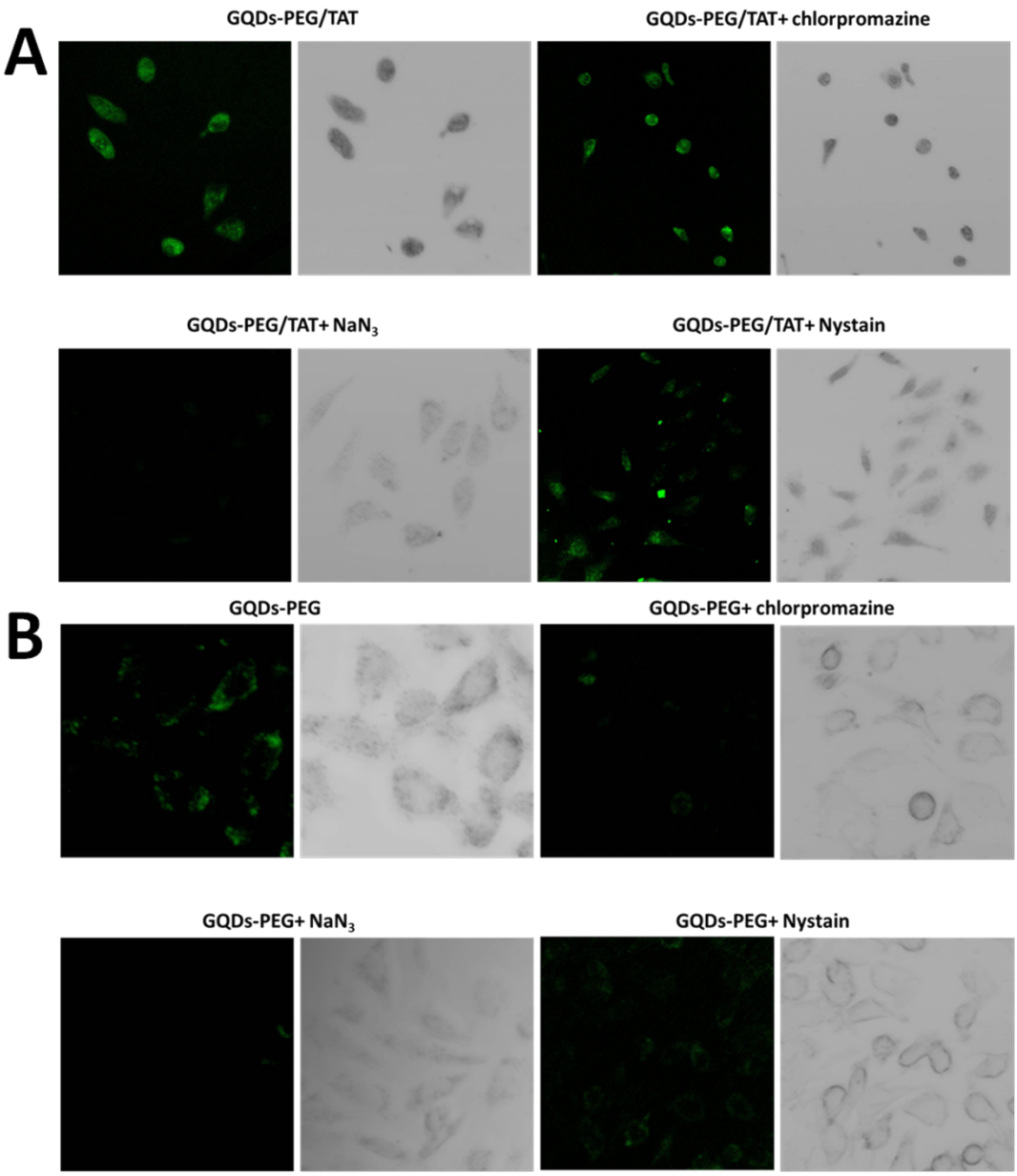


Figure.S1. CLSM images of inhibitor-pretreated HeLa cells incubated with GQDs-PEG/TAT (A) and GQDs-PEG (B) respectively. HeLa cells without pretreatment were examined as controls.

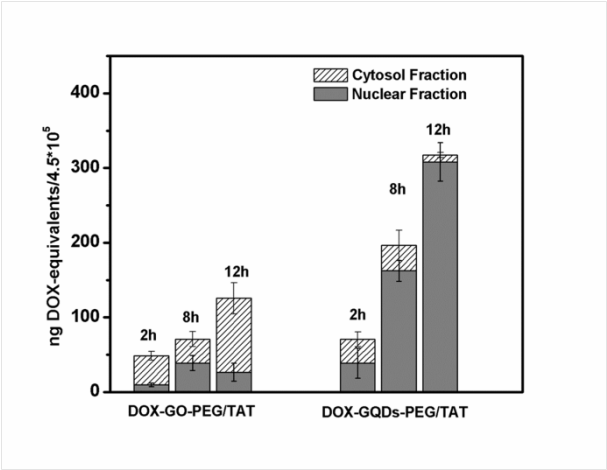


Figure.S2. Quantitative detection of the nuclear and cytosol DOX of HeLa cells after being incubated with DOX-GO-PEG/TAT and DOX-GQDs-PEG/TAT for different time。

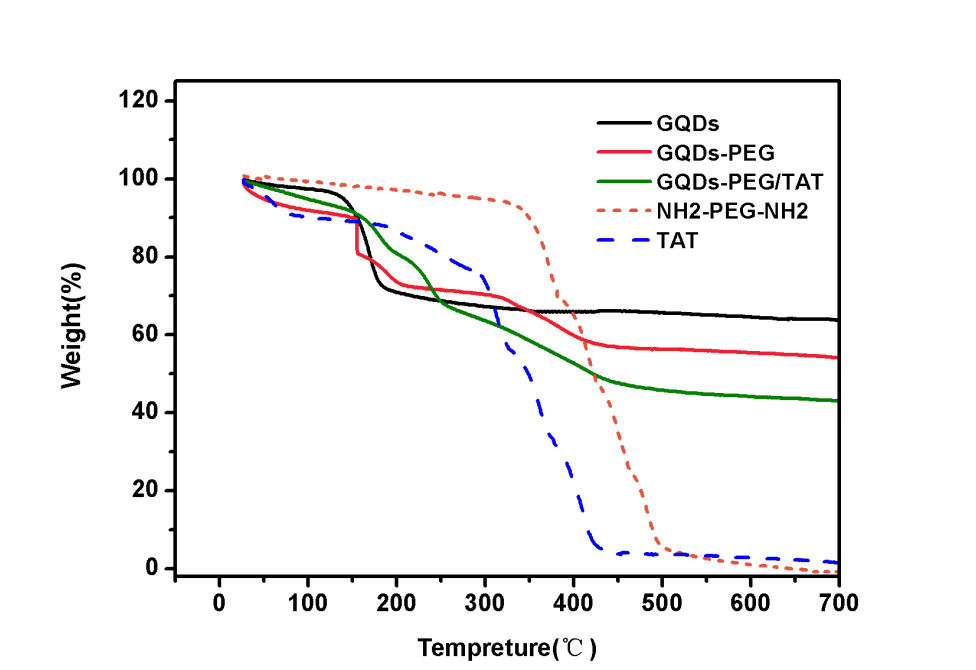


Figure S3. TGA graph for GQDs (control), GQDs-PEG, GQDs-PEG/TAT composites, NH_2-PEG-NH_2 and TAT.

Table S1. The coupling efficiency of NH_2-PEG-NH_2 and TAT.

Composite	NH_2-PEG-NH_2 content (w/w)%	TAT content (w/w) %	GQDs content (w/w) %
GQDs-PEG/TAT	13.8	20	66.2

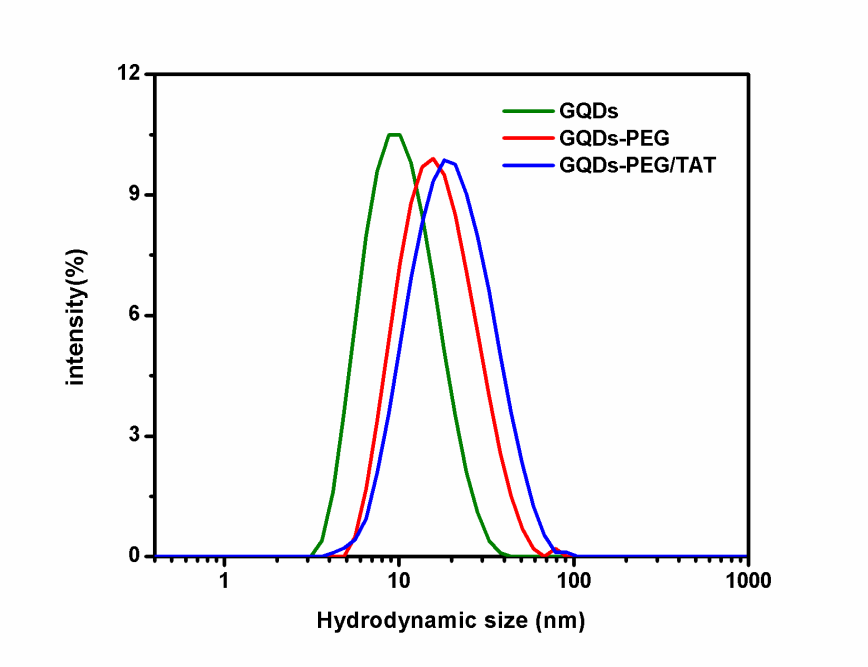


Figure S4. Hydrodynamic size distribution of GQDs, GQDs-PEG and GQDs-PEG/TAT.

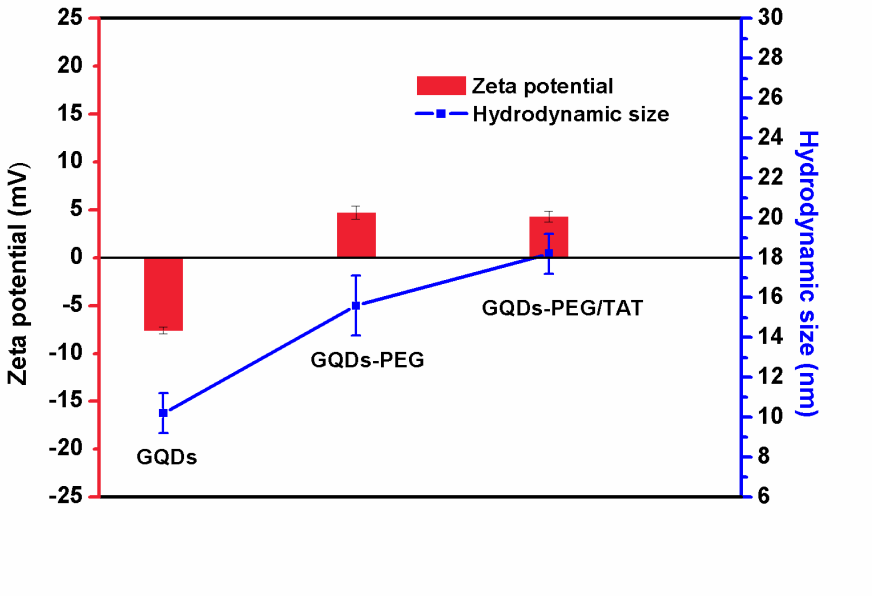


Figure S5. Zeta potential and DLS size measurement of GQDs, GQDs-PEG and GQDs-PEG/TAT.

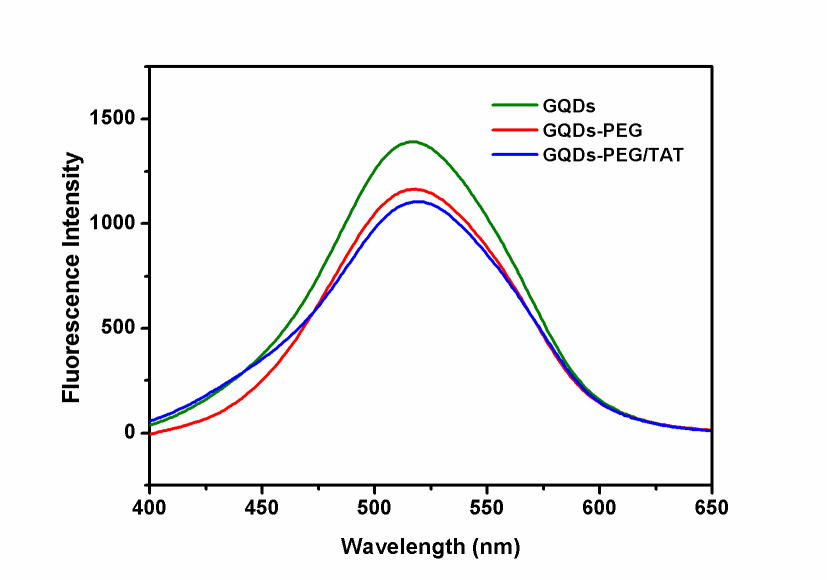


Figure S6. Fluorescence spectra of GQDs, GQDs-PEG and GQDs-PEG/TAT.

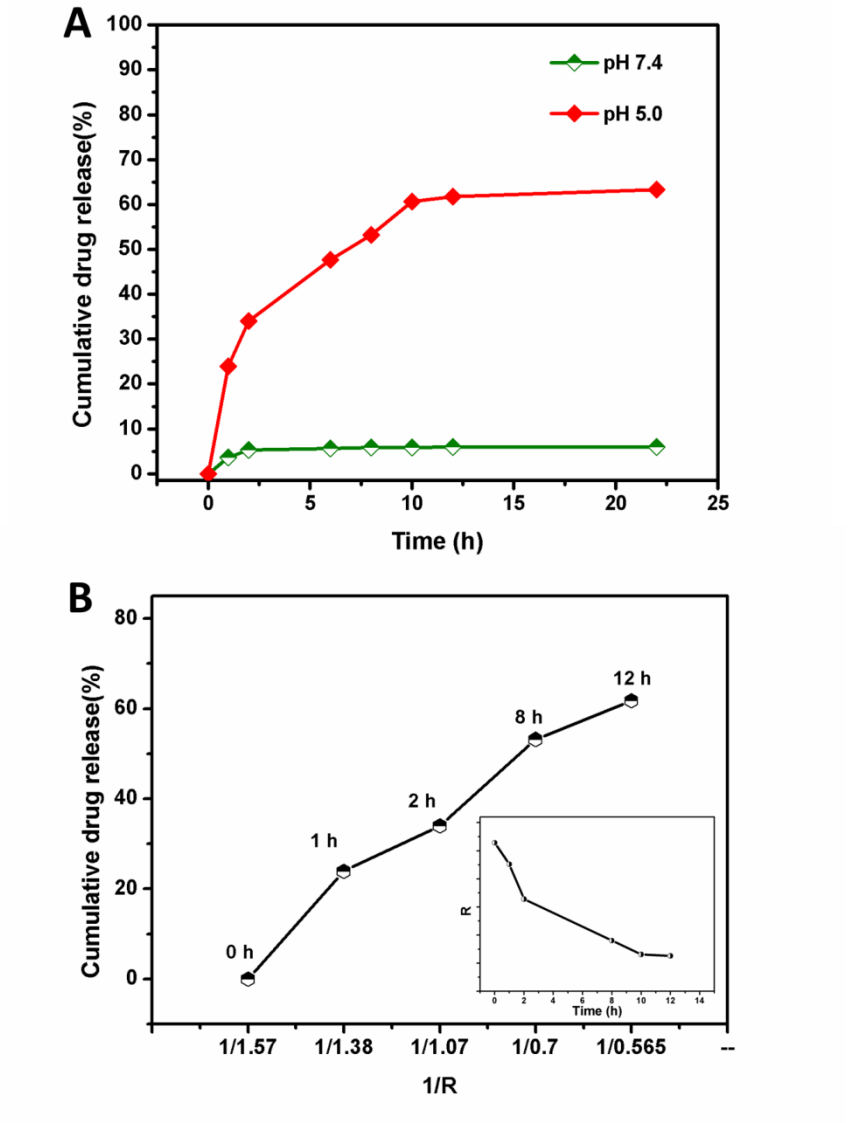


Figure S7. (A) Drug release profile of DOX from GQDs-based FRET carriers. (B) Correlation between the percentage of DOX released DOX percentage and change in the FRET signal (plotted as 1/R) at varied different time points (Inset: Change in FRET signal R at different time points).

DOX loading was carried out by mixing 100μl of 10mg/ml DOX (final concentration 0.2mg/ml) with 5 mL 0.1mg/mL GQDs-PEG/TAT for 24 hours at room temperature. Unloaded DOX was removed by dialysis.

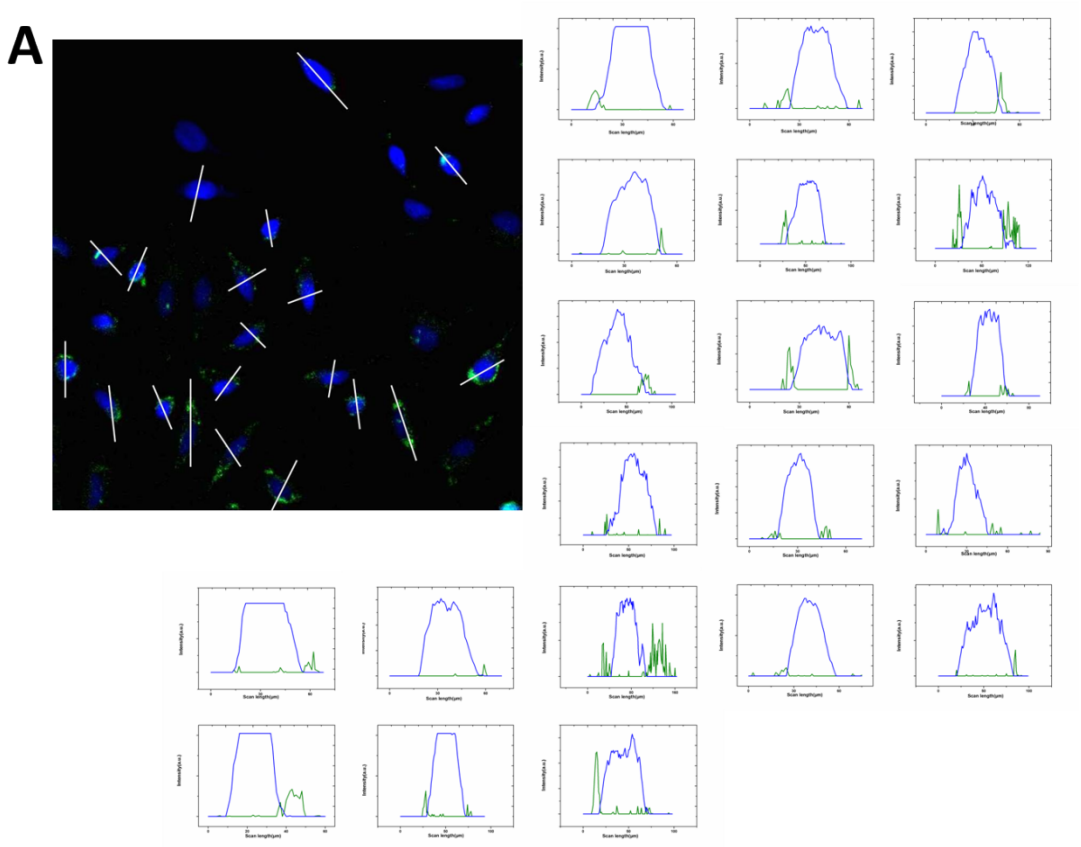
The absorbance A_1 at 488nm of the as-synthesized DOX-GQDs-PEG/TAT and absorbance A_2 at 488nm of no DOX loaded GQDs-PEG/TAT were measured, and A_1 -A_2 is corresponding to the absorbance of loaded DOX. Then, the amount of loaded DOX was calculated according to a calibration curve recorded with known

concentrations. The drug loading efficiency was calculated by the equation, % LE of DOX= $\frac{DOX_l}{DOX_i} \times 100$

DOX_i is the initial amount (mg) of DOX, DOX_l is the amount of loaded DOX.

Table S2. Loading efficiency of DOX.

Loading Condition	Inatial DOX mg/ml	Loaded DOX mg/ml	%LE of DOX
Buffered solution(pH 7.4)	0.2	0.139	69.5



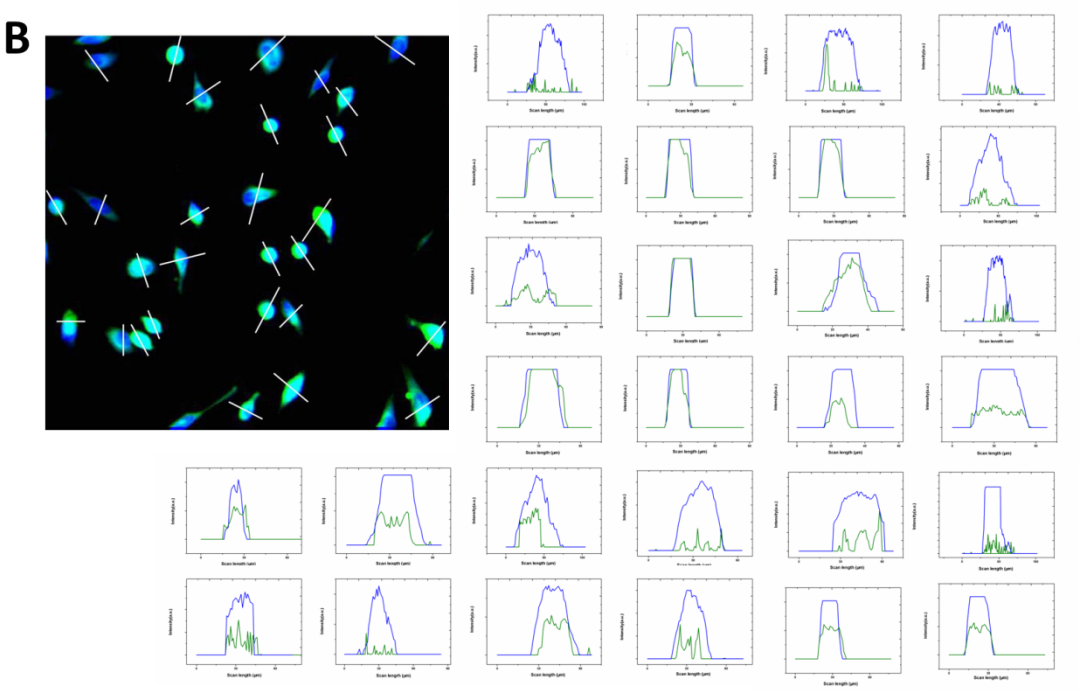


Figure S8. Confocal laser scanning microscopy (CLSM) images and line scanning profiles of fluorescence intensity of HeLa cells incubated with (A) GQDs-PEG and (B) GQDs-PEG/TAT for 4h. The Green fluorescence is from GQDs. The blue fluorescence is from NucRed Live 647 used to stain the nuclei.