Supporting Information

Precise and Label-free Tumor Cell Recognition Based on A Black Phosphorus Nanoquenching Platform

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1. Quenching ability of BPNSs to GFP

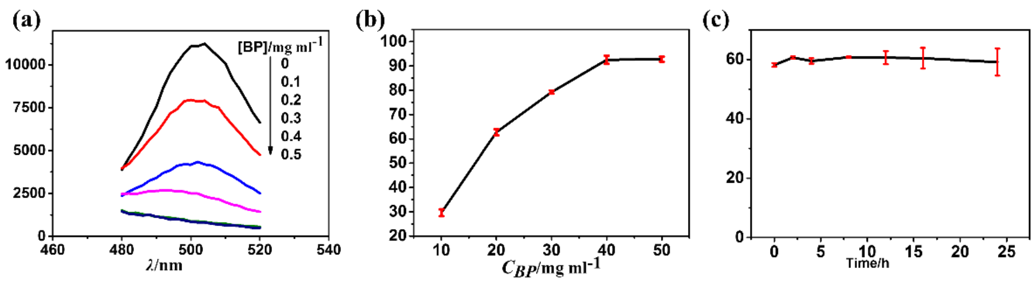

Fig S1. Quenching ability of BPNSs. (a) Fluorescence spectra of GFP in the presence of different concentrations of BPNSs as indicated; (b) Quenching efficiency for GFP is positively correlated with BP concentration. (c) Stable quenching by BPNSs over time. C_{GFP} =0.155mg/mL, λex=395nm.

2. Discussions of quenching mechanism of BP.

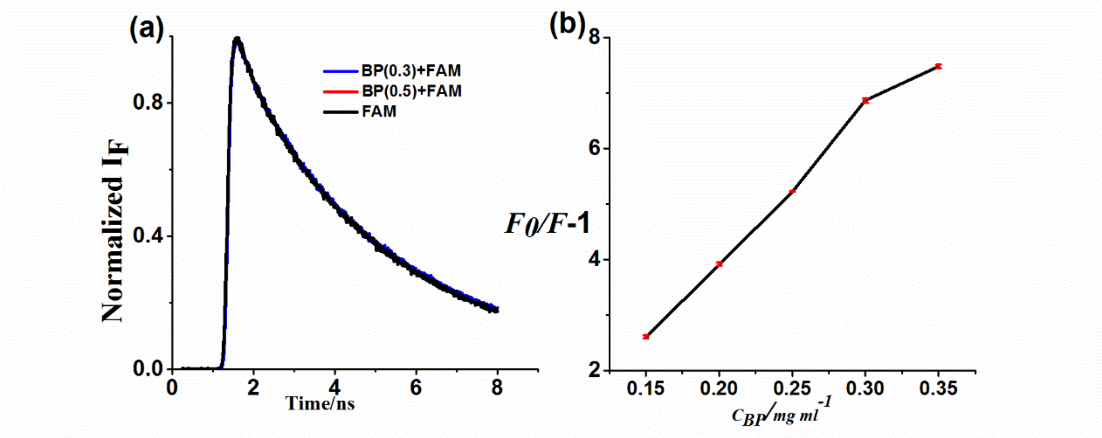

Fig S2. (a) Fluorescence lifetime of FAM alone (50 nM, black line) and FAM in the presence of BP 0.5mg/mL (red line) or 0.3mg/mL(blue line), λex=488nm; (b) Stern-Volmer plot of the mixture BP+FAM at different concentrations of BP, C_{FAM} =50nM, λex=470nm.

Generally, there are two types of quenching: static and dynamic quench. Assessment of the fluorescence lifetime (FLT) will provide strong evidence for identifying quenching types. A static quenching (also referred to as contact quenching) is defined if the FLT of a fluorophore remains same in the presence or absence of a quencher; on the contrary, a significant reduction of FLT would suggest a dynamic quenching.[1] In order to identify the quenching type of BP, the FLTs of FAM in the presence or absence of BP nanosheets were measured. As shown in Figure S2 (a), the FLTs of FAM in every case was almost synchronous, indicating the quenching process by BP nanosheets was static quenching. In addition, quenching rate constant *Kq* can be calculated using Stern-Volmer's equation: [2, 3]

$$\frac{F_0}{F} - 1 = K_{sv}C_q = K_q \tau C_q \qquad (1)$$

Where F_0 and F are fluorescence intensities of FAM without or with BPNSs, respectively, Ksv is the quenching constant, and τ is the FLT of a fluorophore. From experimental data shown in Figure S2 (b), we obtained Ksv=25.4M^{-1}, i.e. slope of the curve. The measured FLT of FAM was 3.9 ns. Therefore, Kq=7.87×$10^{12}M^{-1}s^{-1}$, which is two orders higher compared to that of dynamic quenching (Maximum value is 1.0×$10^{10}M^{-1}s^{-1}$), [4] further confirmed the quenching mechanism of BP is static quenching.

3. Quenching ability of BPNPs to Cy3-AptER.

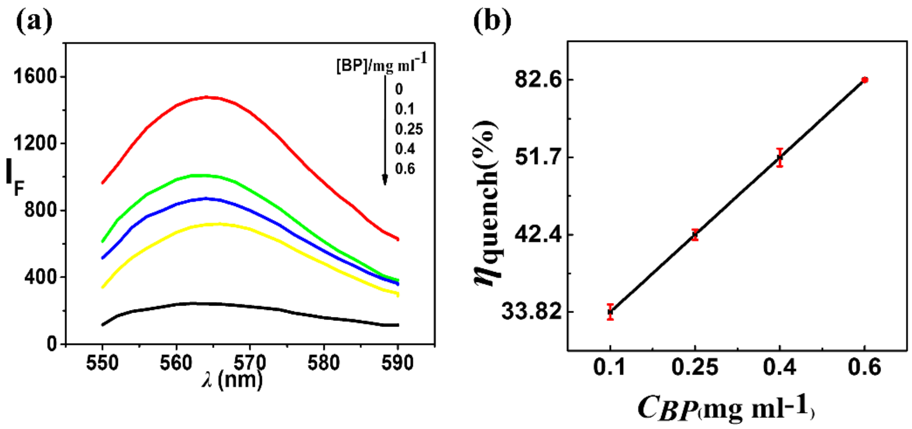

Fig S3. Quenching effective of BPNPs to Cy3-AptER. (a) The fluorescent spectra of Cy3-AptER mixed with different concentrations BP nanoquencher; (b) Concentration-dependent quenching ratio by BP nanosheets, C_{BP}=0.4mg/mL. $C_{Cy3\text{-}AptER}$ =100nM, λex=500nm.

4. Quenching ability of BPNPs to FAM-AptM.

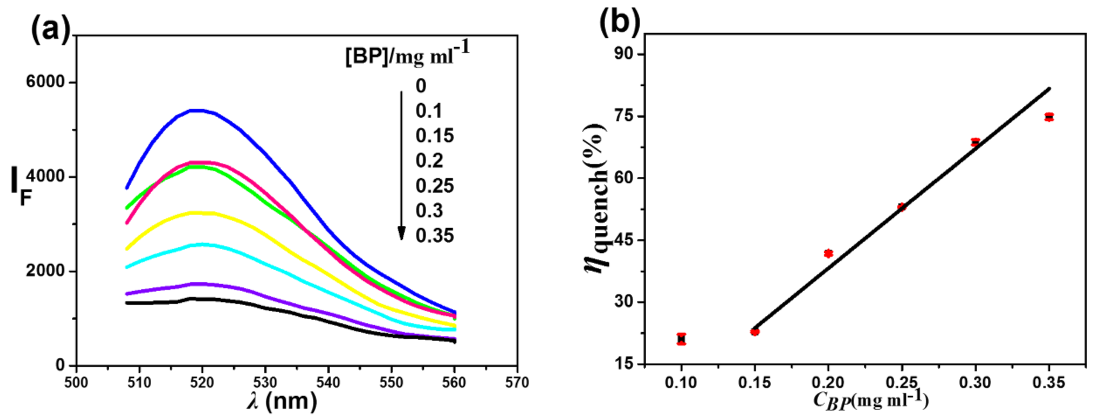

Fig S4. Quenching effective of BPNPs to FAM-AptM. (a) The fluorescent spectra of FAM-AptM mixed with different concentrations BP nanoquencher; (b) Concentration-dependent quenching ratio by BP nanosheets, C_{BP}=0.25mg/mL. $C_{FAM\text{-}AptM}$ =50nM, λex=470nm.

References

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