Electronic Supplementary Material (ESI) for Nanoscale.

Surface engineered vanadium nitride nanosheets for imaging-guided photothermal/photodynamic platform of cancer treatment

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 # Equal contribution from Chunyu Yang and Huahai Yu

Experimental

Calculation of the photothermal conversion efficiency

The photothermal conversion efficiency (η) of VNPBs nanosheets was calculated according to the established method.

$$\eta = \frac{hA\left(T_{max} - T_{surr}\right) - Q_{dis}}{I\left(1 - 10^{-A_{\lambda}}\right)} \qquad \textbf{Equation S1}$$

In the Equation S1, T_{max} and T_{Surr} are the equilibrium and ambient temperature, respectively. h is the heat transfer coefficient, A is the surface area of the quartz tube, Q_{dis} represents heat dissipation from the sample dispersion in quartz cell to the surroundings, I is power of incident laser, A_{λ} is the absorbance of VNPBs solution at 1064 nm. Thus, only the hA remains unknown.

To obtain hA, it introduced a dimensionless driving force temperature (θ). The cooling time t and θ abide by the following Equation S2 and S3 at the cooling stage of VNPBs solution. Hence, time constant (τ_s) for heat transfer could be determined and the value of hA is obtained according to Equation S4.

$$\theta = \frac{T - T_{surr}}{T_{max} - T_{surr}} \qquad \textbf{Equation S2}$$

$$t = -\tau s \ln(\theta) \qquad \textbf{Equation S3}$$

$$hA = \frac{\sum m D C D}{\tau s} \qquad \textbf{Equation S4}$$

Where m_D is the mass of water and C_D means the heat capacity of water.

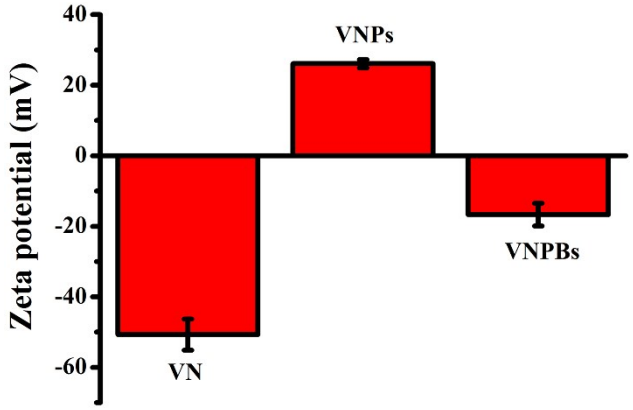

Fig. S1 Zeta potentials of VN, VNPs, VNPBs nanosheets.

Fig. S2 Photographs of VNPBs nanosheets dispersed in deionized water, DMEM, PBS and FBS, respectively.

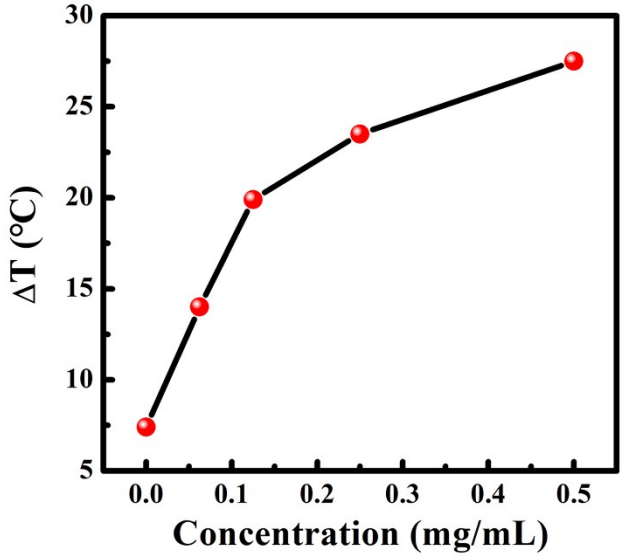

Fig. S3 Plot of temperature change (ΔT) versus the different concentrations of VNPBs nanosheets during the period of 10 min irradiation.

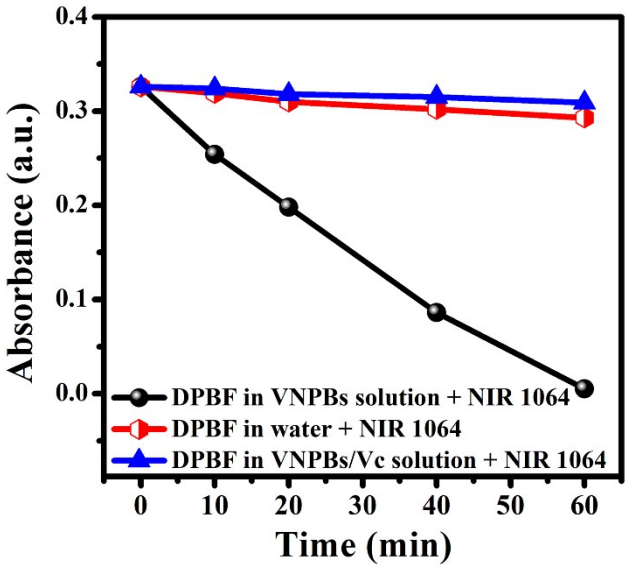

Fig. S4 Absorption spectra of DPBF in deionized water and VNPBs nanosheets with/without Vc after various irradiation times.

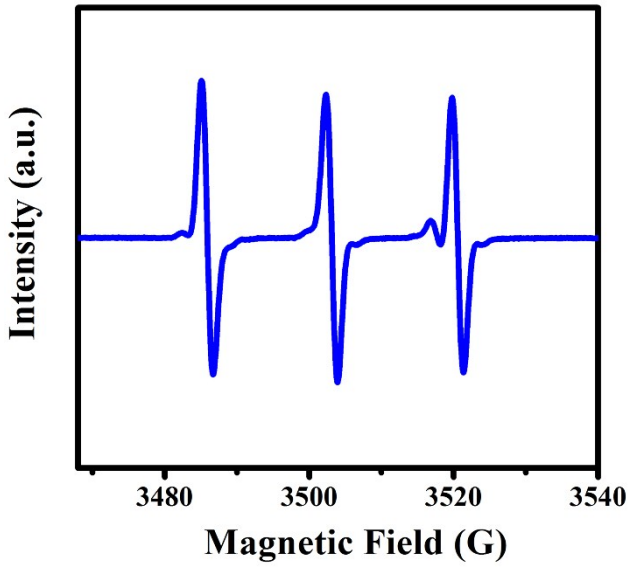

Fig. S5 ESR spectra of VNPBs nanosheets with TEMP probes under 10 min irradiation.

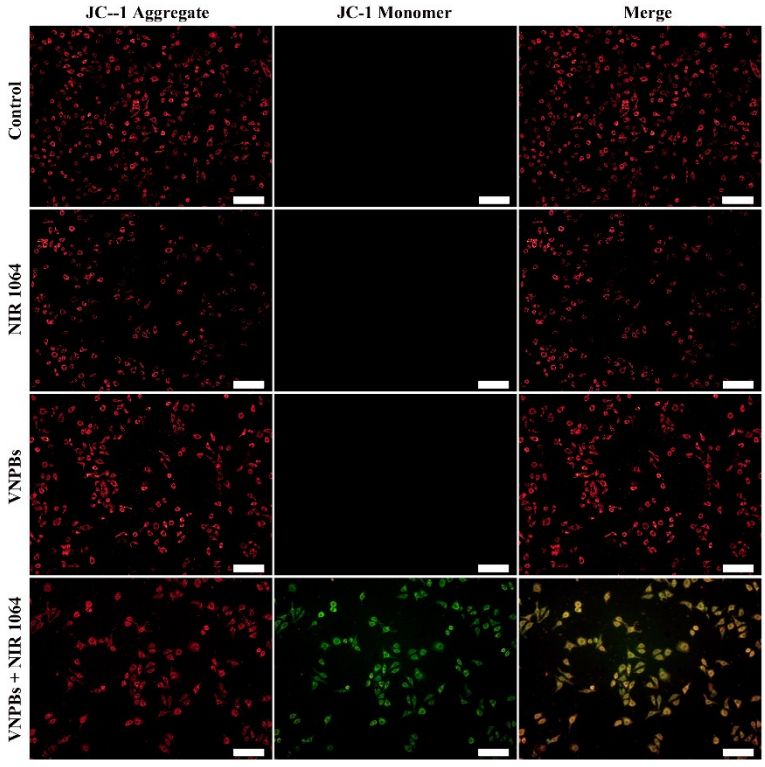

Fig. S6 Detection for mitochondrial membrane potential after different treatments by JC-1 staining. (Scale bar = 100 μm.)

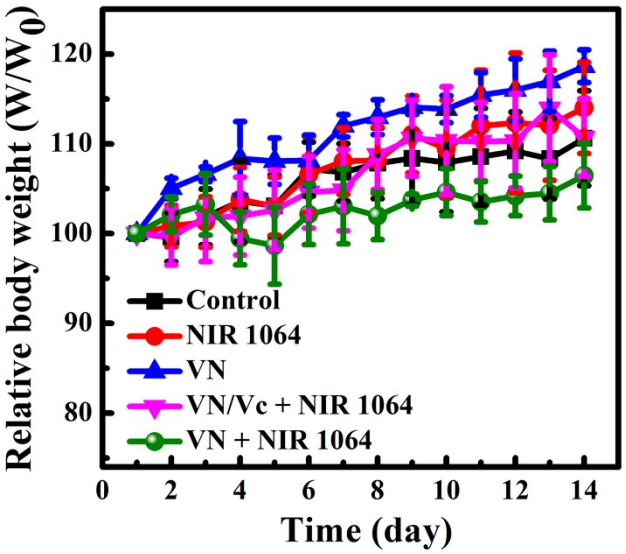

Fig. S7 Variation of relative body weight of mice after different treatments during 14 days.

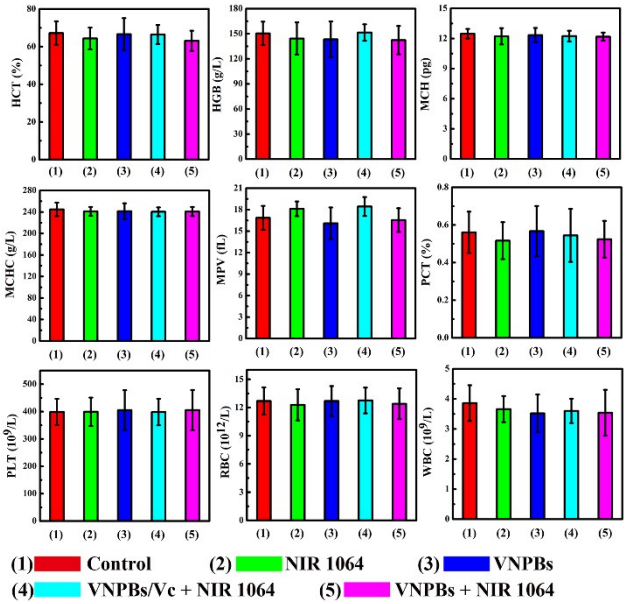

Fig. S8 The hematological analyse for different treatment groups of mice at 14th day.