Supporting information

A double fluorescent nanoprobe based on phosphorus/nitrogen co-doped carbon dots for detecting dichromate ion and dopamine †

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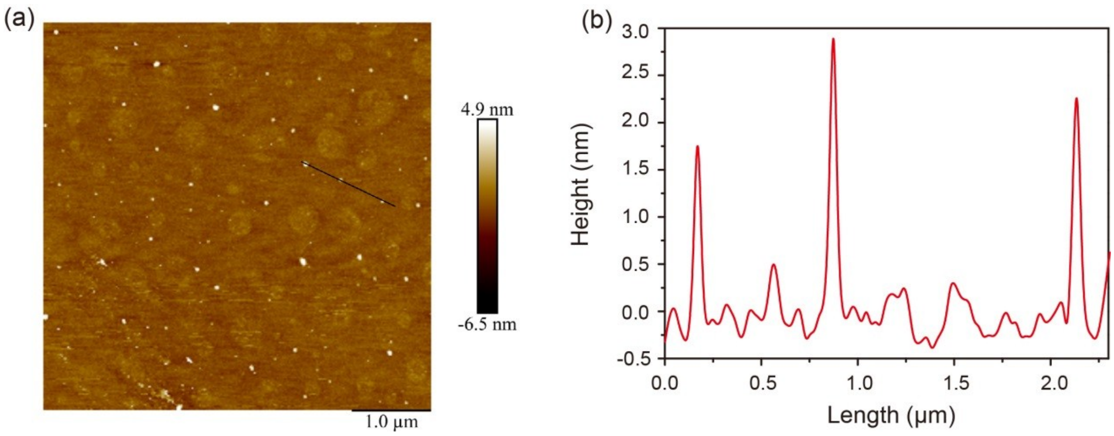

Fig.S1. (a) AFM image of PNCDs. (b) height profile of PNCDs

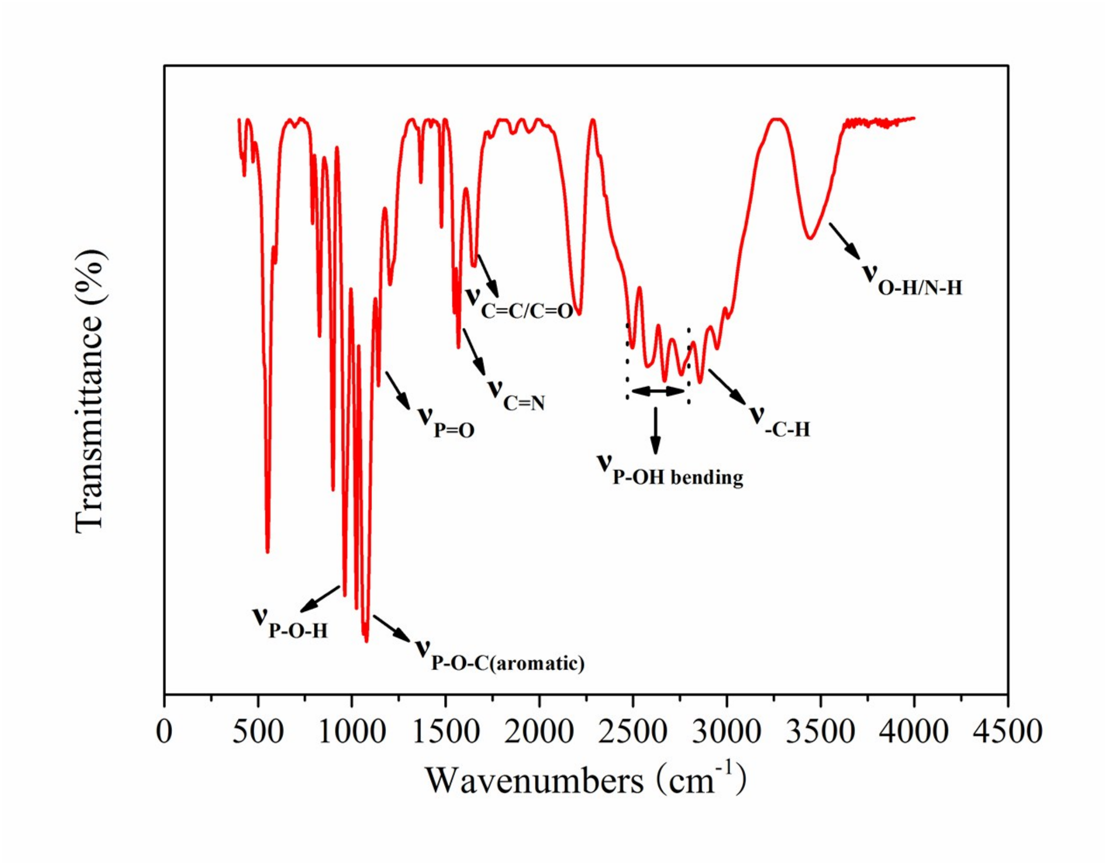

Fig.S2. FTIR spectra of PNCDs.

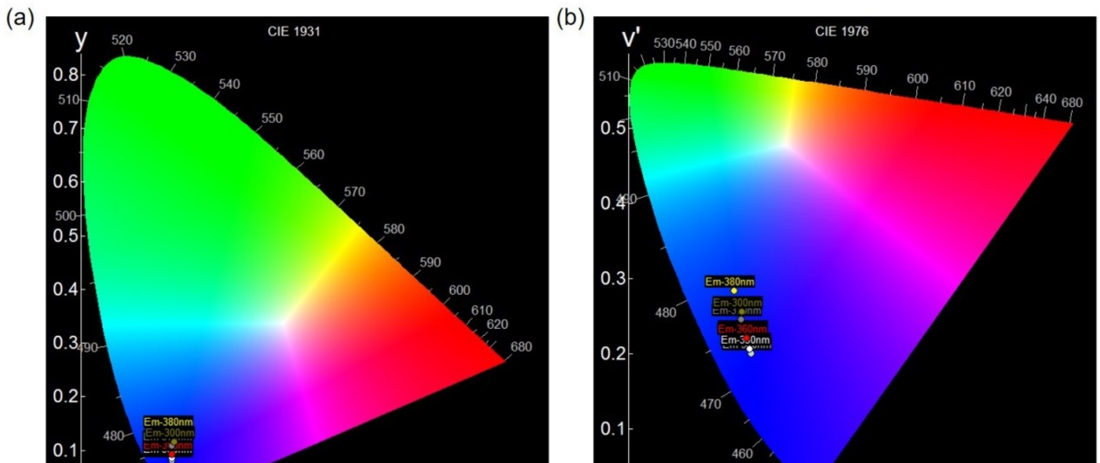

Fig.S3. (a) CIE co-ordinate map 1931 of PNCDs with different excitation wavelengths. (b) CIE co-ordinate map 1976 of PNCDs with different excitation wavelengths.

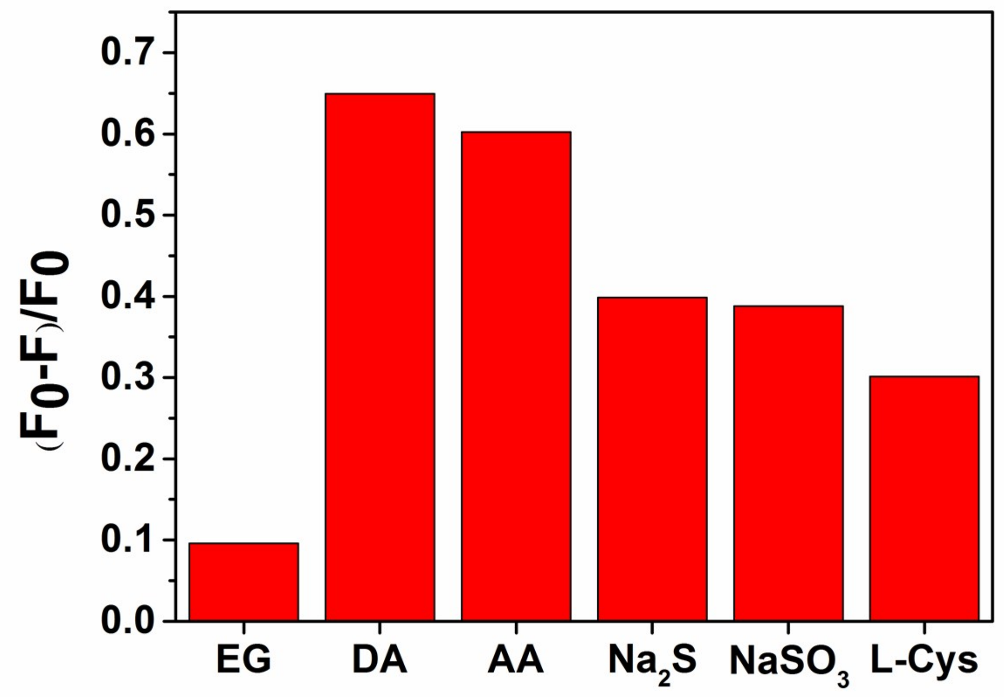

Fig.S4. (F_0-F)/F_0 of the PNCDs in PBS (pH: 7.4) with 160 μM different reducing substances. F and F_0 correspond to the fluorescence intensities of the PNCDs without and with 160 μM of different reducing substances.

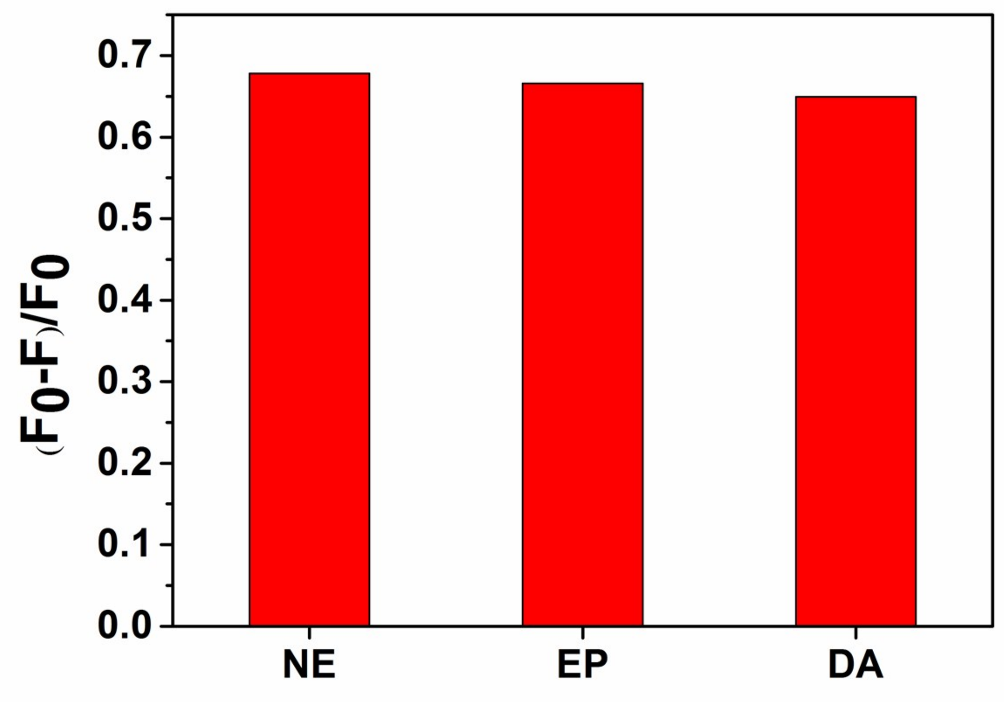

Fig.S5. (F_0-F)/F_0 of the PNCDs in PBS (pH: 7.4) with 160 μM analogues of dopamine. F and F_0 correspond to the fluorescence intensities of the PNCDs without and with 160 μM of two kinds of analogues of dopamine.

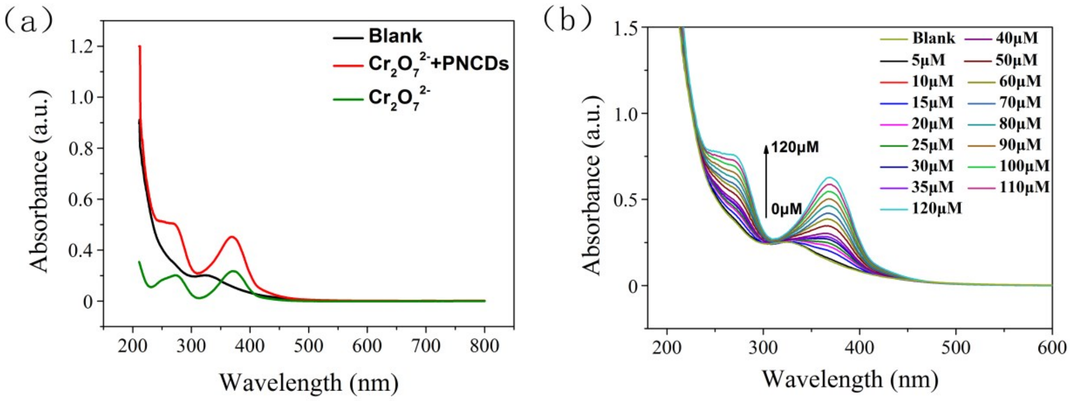

Fig.S6. (a) UV–vis spectra of the PNCDs, PNCDs/Cr(VI), and Cr(VI) solution. (b) UV–vis spectra of the PNCDs with different concentrations of Cr(VI) (0μM—120μM)

The UV–vis spectra of the PNCDs, PNCDs/ Cr(VI), and Cr(VI), shown in Fig. S4a, After the addition of Cr(VI), Fig. S4a exhibited two peaks at 370 nm and 273nm which are characteristic of Cr(VI) species, on the contrary, absorption peak of PNCDs disappeared. With the increase of concentration of Cr(VI), ultimately, absorption peak of PNCDs/Cr(VI) completely turns into the absorption peak of Cr(VI). In the process, new absorption peak is not explored, which suggests that no complex formation or energy transfer is existent. Thereby definite IFE is the only possible dominated reason for the fluorescence quenching of PNCDs induced by Cr(VI).

In order to further prove this design, we conduct the different concentrations of Cr(VI) and monitor the absorption changes of PNCDs with UV–vis spectra in Fig.S4b. With the increases of concentration of

Cr(VI) from 0 to 120 μM, the absorptions caused by Cr(VI) around 273nm and 370 nm are increased, respectively. Finally, absorption peak of PNCDs-180 completely turns into the absorption peak of Cr(VI) without any appearance of new absorption peak which is a signal of complex formation or occurrence of chemical reaction. The phenomenon demonstrates the rationality of IFE based fluorescence quenching.

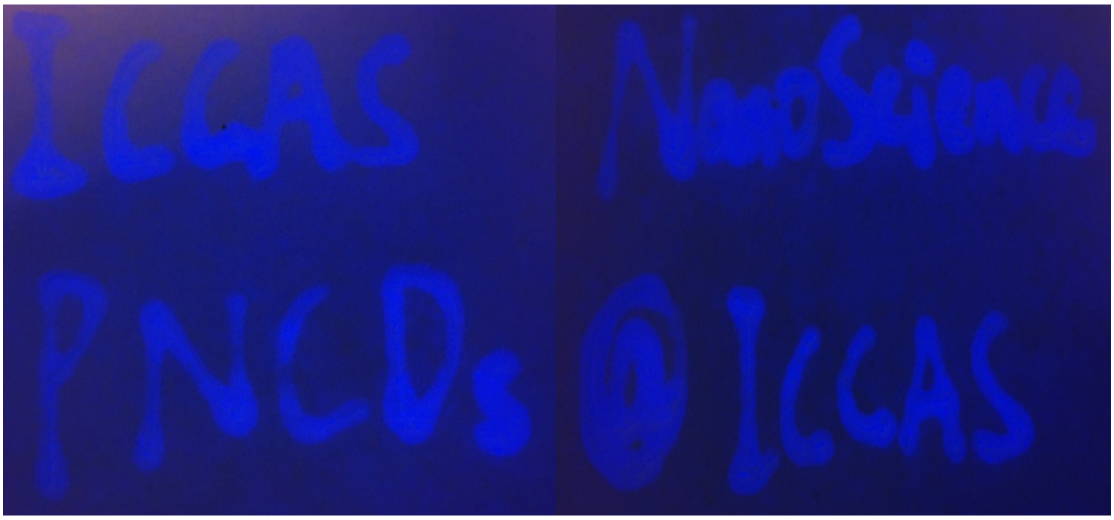

Fig.S7. the hand written name of the corresponding address and carbon nanoparticles using fluorescent PNCDs coated filter paper under UV light excitation.

In view of the good optical property and chemical durability of PNCDs, we have also employed the highly fluorescent PNCDs as a fluorescent ink for display purposes. The PNCDs aqueous solutions can be used as a new type of fluorescent ink. The aqueous solution of PNCDs was directly injected into a pen without any chemical modification. The name of the carbon dots and the workplace's name of author written on filter paper excited using a UV lamp is visible to the naked eye and readily flow while writing without any leakage and coagulation within the pen in

Fig.S5. The carbon dots based fluorescent ink doesn’t contaminate nib and tube of fountain pen and can be easily washed off from water. Moreover, the resulting water soluble PNCDs ink is clear, permanent, pollution free, biocompatible and easily washable. Therefore, PNCDs ink might be an alternative and potential for fluorescent pens.