

## Electronic Supplementary Information

### **Defect Engineering Route to Boron Nitride Quantum Dots and Edge-Hydroxylated Functionalization for Bio-Imaging**

Jung-Hwan Jung,<sup>a</sup> Moumita Kotal,<sup>a</sup> Min-Ho Jang,<sup>b</sup> Junseok Lee,<sup>c</sup> Yong-Hoon Cho,<sup>b</sup> Won-  
Jong Kim<sup>c</sup> and Il-Kwon Oh<sup>a\*</sup>

*a. Creative Research Initiative Center for Functionally Antagonistic Nano-Engineering, Department of  
Mechanical Engineering, Korea Advanced Institute of Science and Technology (KAIST), 291 Daehak-ro,  
Yuseong-gu, Daejeon 34141, Republic of Korea*

*b. Department of Physics, Korea Advanced Institute of Science and Technology, 291 Daehak-ro, Yuseong-gu,  
Daejeon 305-701, Republic of Korea*

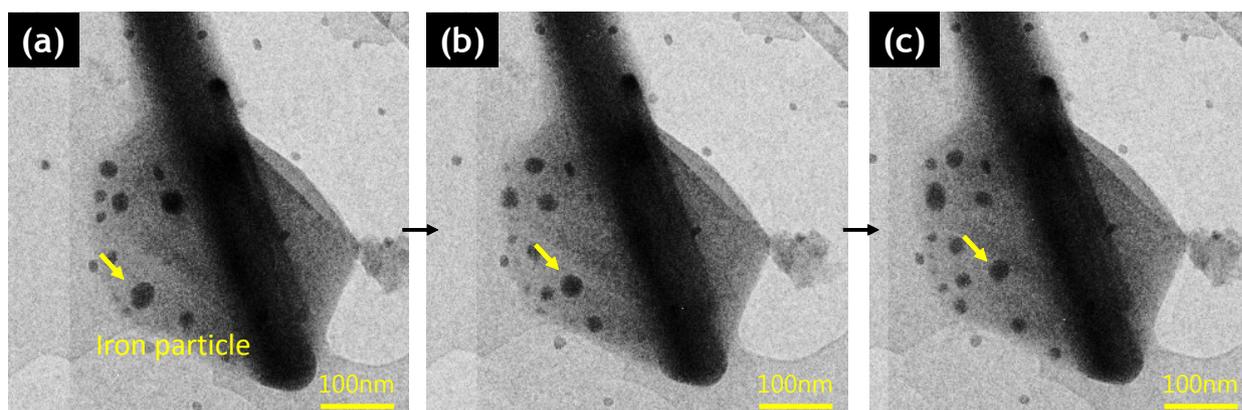
*c. Center for Self-assembled Complexity, Institute of Basic Science (IBS), and Department of Chemistry, Pohang  
University of Science and Technology (POSTECH), Pohang 37673, Republic of Korea*

\* Corresponding author

Phone: +82-42-350-1520, Fax: +82-42-350-1510, e-mail: [ikoh@kaist.ac.kr](mailto:ikoh@kaist.ac.kr)

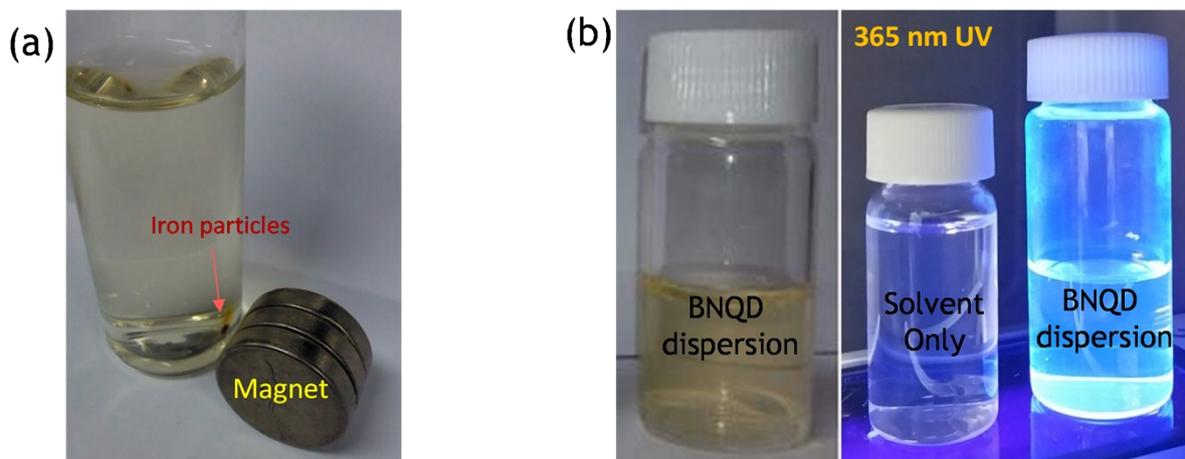
**Table S 1.** XPS peak table of atomic percentage.

element	BNQD	EH-BNQD
B	45.93	45.33
N	43.01	43.09
O	7.03	7.5
C	4.03	4.08

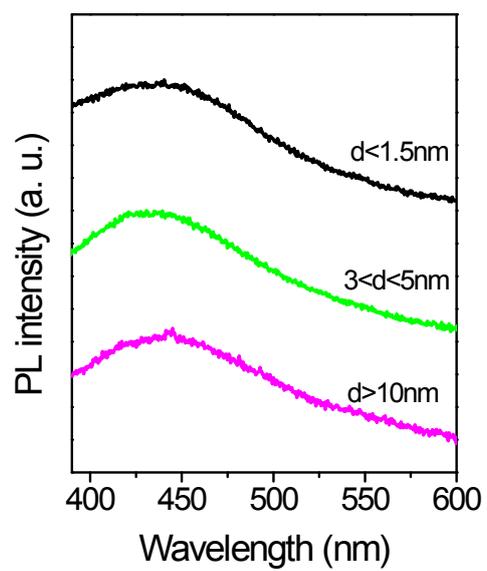


**Figure S1.** Snap pictures of motion records by in-situ TEM. The iron nanoparticles are moving to the middle area from the edge. According to the movement of iron nanoparticles, the BN flake is damaged.

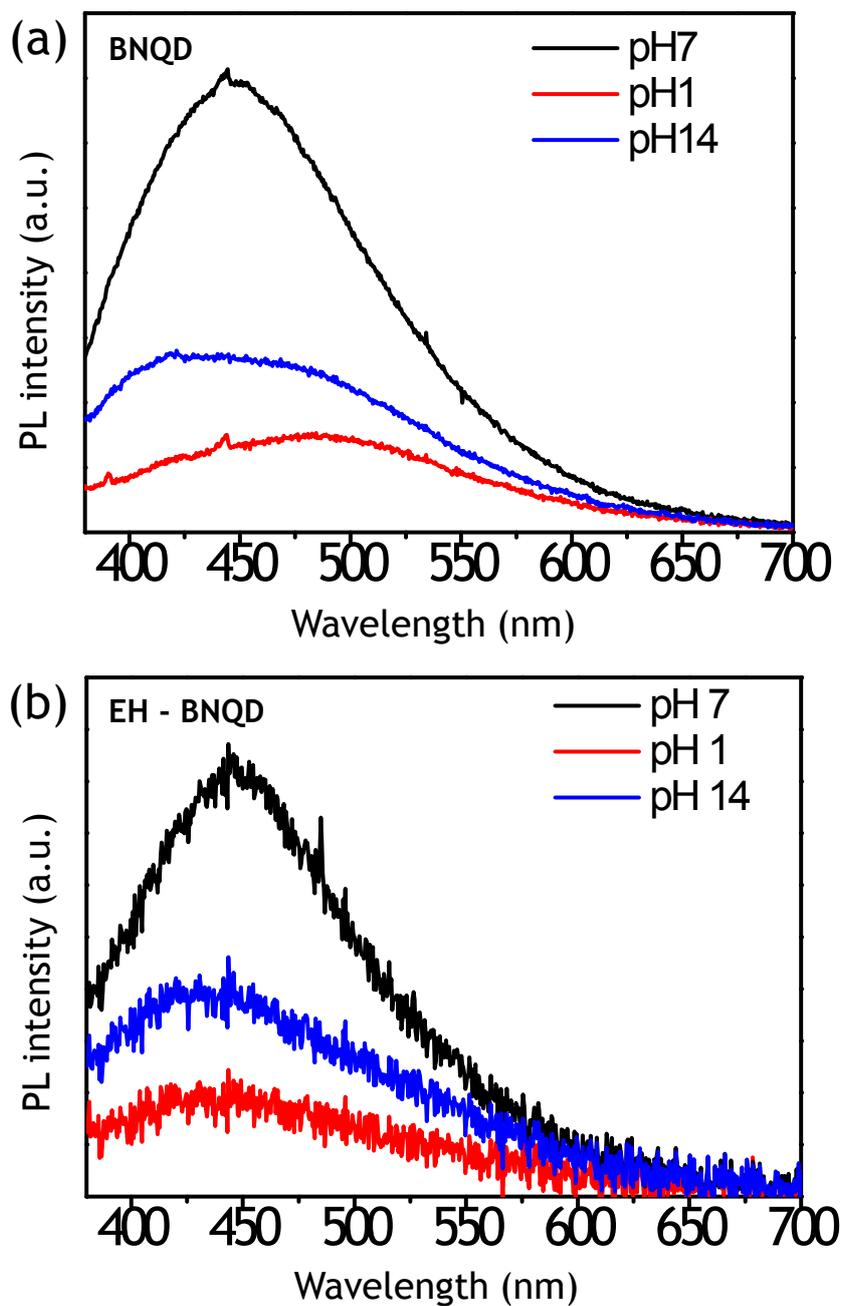
The thermal treatment temperature was 700°C by heating coil in in-situ TEM.



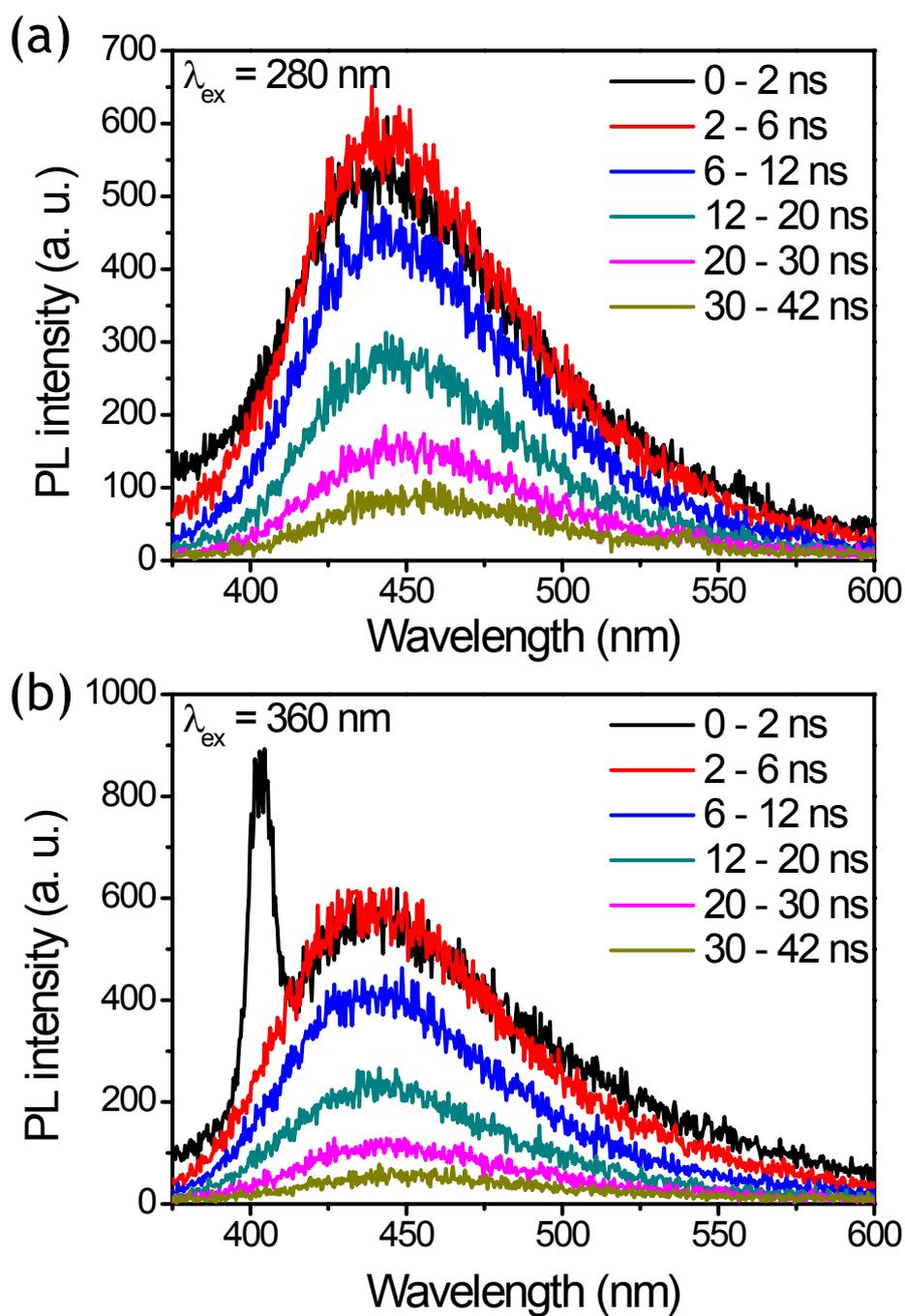
**Figure S2.** Photograph of BNQD (a) Iron nanoparticles are removed by permanent magnets (b) BNQDs are well dispersed with DIwater and blue colored photo luminescent occurred under 365nm UV light excitation. It was compared with DIwater which used for dispersion solvent.



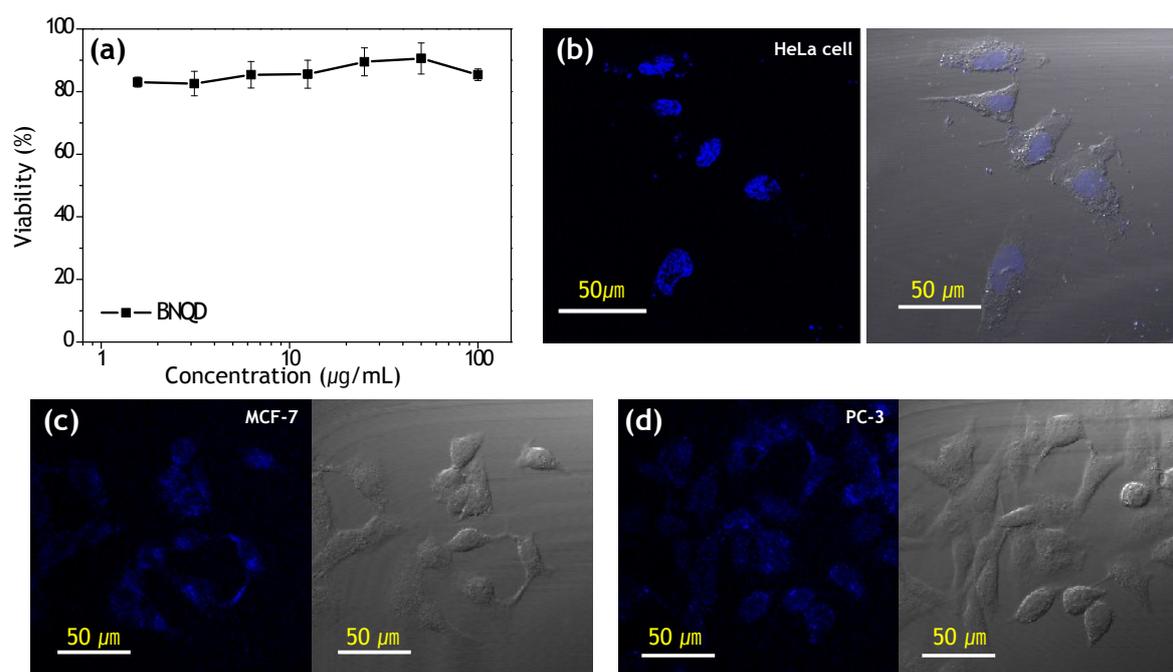
**Figure S3** PL intensity of BNQDs filtered with different pore sizes by 325 nm He-Cd CW laser.



**Figure S4.** PL spectra of BNQD and EH-BNQD irradiated by 325 nm He-Cd CW laser. The PL at 450nm shows sensitive response for the change of pH condition. It is related to defect sites for oxygen, the oxygen bonding on 2D material is very sensitive to the pH states.



**Figure S5.** Confirmation of the carrier dynamics after pump event, the temporal profile of time-integral PL (TIPL) is summarized irradiated by (a) 280 nm and (b) 360 nm exhibit a little spectral migration. (b) Sharp peak indicate the Raman spectra of DI water solvent.



**Figure S6.** Result of Bio imaging (a) Cytotoxicity of BNQDs for 48 hours (b-d) confocal laser microscopic images of BNQDs by each cells.