



Conference Proceeding

# Atom Precision Clusters for Cancer Radiotherapy and NIR-II Imaging

Junying Wang<sup>1,2</sup>, Xiaoyu Mu<sup>1</sup>, Haile Liu<sup>1,2</sup>, Xiaodong Zhang<sup>1,2</sup>✉<sup>1</sup>Department of Physics and Tianjin Key Laboratory of Low Dimensional Materials Physics and Preparing Technology, School of Sciences, Tianjin University, Tianjin 300350, China.<sup>2</sup>Department of Medical Engineering and Translational Medicine, Tianjin University, Tianjin 300072, China.

✉ Corresponding authors. E-mail: xiaodongzhang@tju.edu.cn

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## Abstract

The Sub-5 nm ultrasmall were useful for cancer radiation therapy as well as bioimaging. The ultrasmall gold clusters radiosensitizer ( $\text{Au}_{10-12}$ ,  $\text{Au}_{25}$ , and  $\text{Au}_{29-37}$ ) with glutathione protected layer can enhance the radiation process and amplified the radiation effects, such as Compton scattering and photoelectric effect, and thus inducing the DNA damage and enhanced cancer radiotherapy. Besides, the nanodots with highly catalytic properties were developed, which can reduce efficiently the  $\text{H}_2\text{O}_2$  and Hydroxyl free radical and thus protect the health cells against the high energy ray. These high catalytic nanoparticles can induce the improved survival rate of mice up to 90%, compared with only irradiated mice (0%) via cleaning up the reactive oxygen species and related free radicals in body. The designed ultrasmall fluorescent molecule can afford the in vivo traumatic brain injury cerebral imaging in the second near-infrared window (1,100-1,700 nm). All these developed materials can cross the 5.5 nm renal clearance cut off, can be excreted by renal clearance, and minimized the in vivo toxicity.

**Keywords:** Radiotherapy; NIR-II Imaging

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