

## **Supplementary information**

**For**

### **Gamma-Ray Irradiation enhance the linkage of Cotton Fabrics Coated with ZnO Nanoparticles**

Aswin kumar Anbalagan<sup>1</sup>, Shivam Gupta<sup>2</sup>, Ashish kumar<sup>1</sup>, Shu-Chih Haw<sup>3</sup>, Sagar Sunil Kulkarni<sup>4</sup>, Nyan-Hwa Tai<sup>2</sup>, Fan-Gang Tseng<sup>1</sup>, Kuo Chu Hwang<sup>4</sup> and Chih-Hao Lee<sup>1,5,\*</sup>

<sup>1</sup>Department of Engineering and System Science, National Tsing Hua University, Hsinchu, Taiwan 30013

<sup>2</sup>Department of Material Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan 30013

<sup>3</sup>National Synchrotron Radiation Research Center, Hsinchu, Taiwan 30077

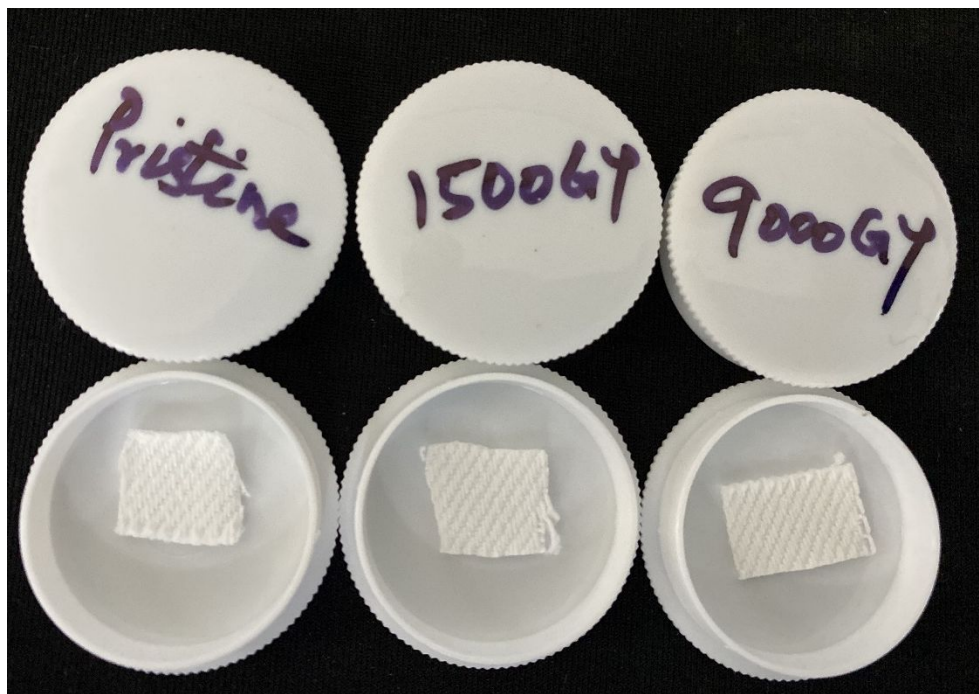
<sup>4</sup>Department of Chemistry, National Tsing Hua University, Hsinchu, Taiwan 30013

<sup>5</sup>Institute of Nuclear Engineering and Science, National Tsing Hua University, Hsinchu, Taiwan 30013

\*Correspondence author: [chlee@mx.nthu.edu.tw](mailto:chlee@mx.nthu.edu.tw)

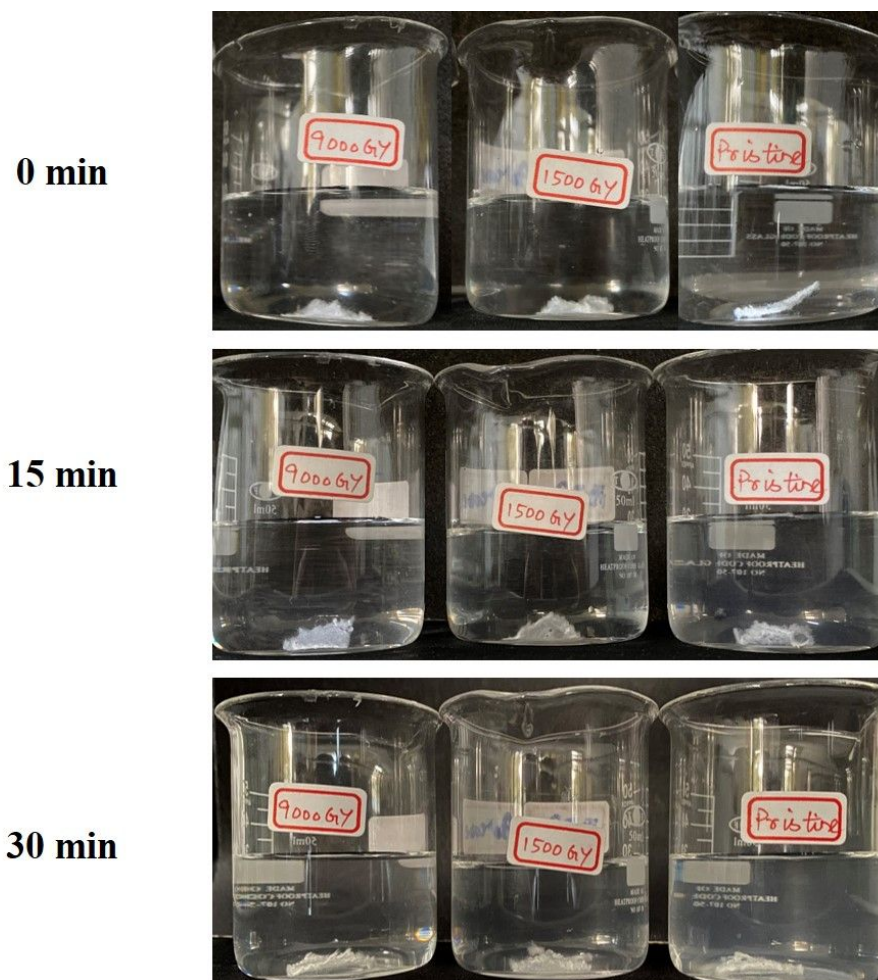
### Physical appearance

Figure S1 shows the physical appearance of ZnO nanoparticles coated cotton fabrics before and after gamma ray irradiation. However, no significant change can be observed.



**Figure S1.** Physical appearance of ZnO nanoparticles coated over fabrics at different doses

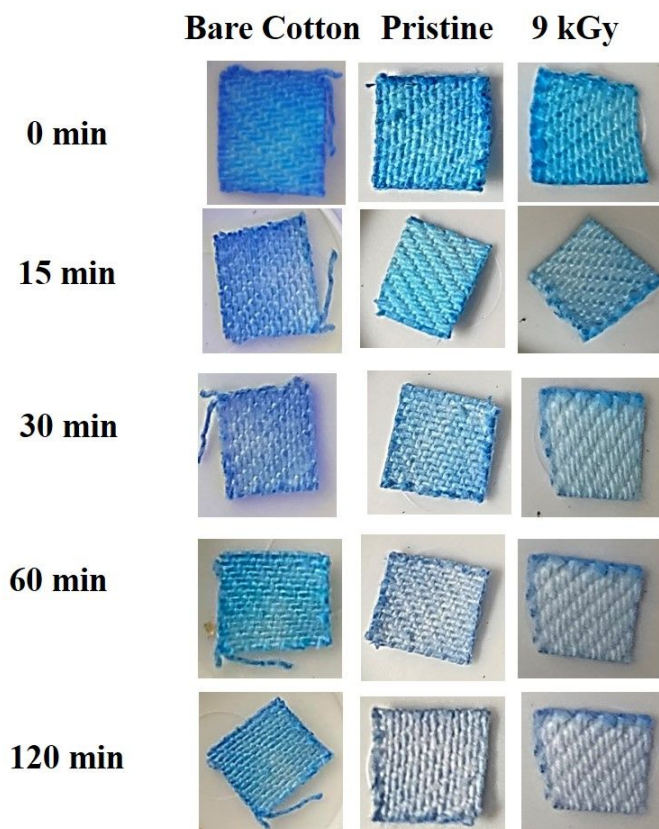
## Stability (washability) of the ZnO nanoparticles on the cotton fabric



**Figure S2. Stability (Washability) of ZnO nanoparticles coated cotton fabrics at different doses for a duration of 0 - 30 min**

## Self-cleaning

The photocatalytic process was carried out using BLAK-RAY Long wave ultraviolet lamp with a power of 100 W. The samples were exposed for a duration of 0-120 min and the respective changes in the physical appearance have been shown below. At 0 min, bare cotton looks more MB adsorbed in comparison to ZnO coated fabrics because of different adsorption property which is considered to be control. Color differences of UV light exposure over the time is compare with the control sample. From Figure S3, we can observe that the color of bare cotton is slightly changed from dark blue to sky blue even after exposure of 120 min suggesting no self-cleaning property. However, the color for pristine and 9 kGy irradiated samples changed from dark blue to utmost white in color after 120 min exposure, suggesting the self-cleaning property of ZnO nanoparticles coated cotton fabrics.



**Figure S3. Photocatalytic self-cleaning of bare cotton, pristine and irradiated ZnO coated cotton fabrics for 0-120 min**