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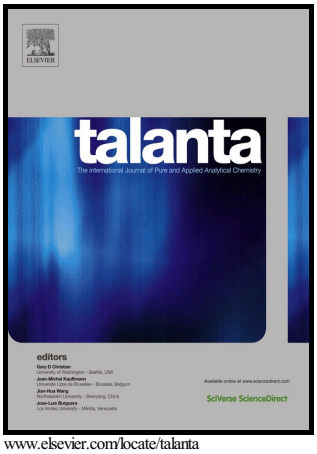

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Colorimetric detection of low dose gamma radiation based on the aggregation of gold nanoparticles and its application for the blood irradiation

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Abstract: To develop a simple and sensitive sensor for gamma radiation is of great importance not only for public safety, but also for rational utilization of ionizing radiation. In this study, a simple and sensitive method for colorimetric detection of low dose gamma radiation has been developed based on the single-strand DNA modified AuNPs (ssDNA-AuNPs), which were synthesized by immobilizing the sulfhydryl ssDNA on the surface of AuNPs. After the gamma radiation, the colors of ssDNA-AuNPs changed from wine-red to blue-purple gradually, and this can be easily distinguished by the naked eyes. Over a range from 0 to 30 Gy, a good linear relationship between the ratio of absorbance at 625 nm to that at 521 nm (A_{625}/ A_{521}) in the UV-vis spectrum and radiation dose was obtained. The detection limit was as low as 0.5 Gy. The colorimetric mechanism was ascribed to the generation of hydroxyl radical during the gamma radiation. As a result, ssDNA was cut off and released from the AuNPs. Then the salt effect caused the aggregation leading to the distinct color change. The capability of the method has also been demonstrated for anti-radiation efficiency comparison of different radioprotectors. In addition, lymphocytes irradiation expriment indicated that the ssDNA-AuNPs prepared in this work can be successfully used for an indicator during blood irradiation to avoid transfusion associated graft *vs.* host disease (TA-GVHD).