Quenching mechanism of 2D MnO2 nanosheet towards Au nanocluster fluorescence clarified

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Researchers at Nanjing University have now clarified the quenching mechanism of 2D MnO_2 nanosheets on Au nanocluster fluorescence and then built a turn on fluorescent sensor for sensitive and selective detection of glutathione (GSH).

Ultra-thin MnO2 nanosheets, one of the promising2D nanomaterials, are of particular interests and have found wide applications in bioanalytical and biomedical studies due to such features as their unique photophysical property, rich redox chemistry, and good biocompatibility. Owing to their broad absorption from d-d transition of Mn2+, MnO_2 nanosheets act as effective quenchers toward numerous fluorescent reporters. By combining such interesting photophysical properties with redox chemistry, biosensing and bioimaging have been achieved with MnO_2 nanosheets. However, the quenching mechanism of fluorescent reporters by MnO_2 nanosheets still remains largely elusive, which in turn would impede their wide application.

To address these issues, Wei and co-workers adopted a nanocluster fluorescent reporter, which is made of a few to hundreds of metal atoms and is more stable than organic dyes. They prepared protein-stabilized Au nanoclusters (named as AuNC), and systematically investigated their fluorescent quenching behaviors using MnO_2 nanosheets. Interestingly, both dynamic and static quenching effects played critical roles in the quenching process while fluorescent resonance energy transfer (FRET)

and inner filter effect (IFE) only played very minor roles in the quenching process. Moreover, they developed a sensitive and selective turn-on sensor for fluorescent detection of GSH, an important antioxidant involved in many cellular processes and diseases. With their newly established method, highly sensitive and selective detection of GSH has been achieved.

Their study further illuminates the mechanisms of nanomaterials-induced fluorescence quenching. It also paves a way to designing turn-on fluorescent sensors for bioanalysis and bioimaging.

More information: 10.1039/C6AY00199H Shichao Lin et al. Deciphering the quenching mechanism of 2D MnO nanosheet towards Au nanocluster fluorescence to design effective glutathione biosensor , *Anal. Methods* (2016). DOI: 10.1039/C6AY00199H

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