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Protein-templated biomimetic synthesis of luminescent noble metal nanocluster for biomedical applications

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Recently, protein-directed biomimetic mineralization has been demonstrated to be an efficient and promising strategy for synthesis of metal nanocluster for biomedical applications. This method is found to be bio-inspired, straightforward and environmentally benign. It can produce intense emitting fluorescent nanocluster with good stability, excellent biocompatibility, high water solubility and rich surface functional groups for further bio-conjunction. Fluorescent noble metal quantum clusters are composed of several tens of atoms and are distinctly different from bulk and metallic nanoparticles. They have sub-nanometer core size with discreet energy levels and show molecule like optical properties. Their easy one step and green synthesis make them particularly attractive. We have prepared protein directed synthesis of gold, silver, copper and gold-silver alloy quantum clusters. The formed highly stable quantum clusters showed intense fluorescence emission and were characterized using UV-Vis spectroscopy, fluorescence, FTIR spectroscopy, Transmission Electron Microscopy (TEM) and X-ray Photoelectron Spectroscopy (XPS). These quantum clusters further can be used for biomedical application including biosensing, such as sensing of biomolecules including neurotransmitter-acetylcholine, creatinine, bilirubin and detection of a toxic metal ion, mercury and the utilization of metal nanocluster for contraceptive applications.

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