A novel full solar light spectrum responsive antimicrobial agent of WS2 quantum dots for photocatalytic wound healing therapy

Photocatalytic antimicrobial therapy (PCAT) is considered to be a potential therapeutic treatment for bacterial-infection diseases. However, the antibacterial efficiency is unsatisfactory due to the limited application scope of photocatalysis. In this work, full-spectrum responsive tungsten disulfide quantum dots (WS2 QDs) are prepared for killing bacteria and enabling wound healing through photocatalytic reactive oxygen species (ROS) generation and glutathione (GSH) depletion. On the one hand, these ultrasmall WS2 QDs exhibit an excellent full spectrum (UV-Vis-NIR)-responsive photocatalytic effect by hindering the recombination of electron-hole pairs, thereby achieving the full use of the energy spectrum. Furthermore, the full-spectrum photocatalytic property of the as-prepared WS2 QDs can be effectively strengthened by redox reaction to deplete GSH for accelerated wound healing. In a word, the as-prepared nanoplatform exhibits the ability to act as an admirable antibacterial reagent with full-spectrum catalytic performance for photocatalytic wound healing therapy. Therefore, this work will not only provide an effective full-spectrum photocatalytic reagent for anti-bacteria therapy and wound healing, but also provide a rational idea for the development of other novel antibacterial agents for applications in the biomedical field.