

Development of Manganese and Gadolinium Co-doped Layered Double Hydroxide Nanoparticles as Sonosensitizer for MRI Guided Sonodynamic Therapy

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Sonodynamic therapy (SDT) is an emerging treatment modality that is activated by non-invasive and clinically accepted ultrasound for effective treatment of various diseases through regulating levels of reactive oxygen species (ROS) in microenvironments [1,2]. Combination of sonosensitizers with MRI contrast agents enables the therapeutics guided by imaging to enhance the treatment effectiveness of SDT [3]. In this work, we report the development of dMnGd-LDH (defect Manganese Gadolinium Layered Double Hydroxide) as nanosonosensitizer to improve the effectiveness of cancer treatment and the accuracy of diagnostics by MRI imaging. Under mild ultrasound irradiation, dMn_{0.6}Gd_{0.01}-LDH exhibits high generation rates of hydroxyl radical ($\bullet\text{OH}$) and superoxide anion ($\text{O}_2^{\bullet-}$) for cancer cells ablation. dMn_{0.6}Gd_{0.01}-LDH has high T₁ and T₂ relaxivity, allowing it to be used as a promising contrast agent for MRI imaging. Moreover, coating the particles' surface with pH responsive polymer (PEG/PA-DM) prolongs the circulation time and tumour accumulation for enhanced MRI-guided SDT [4]. Therefore, successful development of dMn_{0.6}Gd_{0.01}-LDH provides a new sonosensitizer option for MRI-guided SDT platform.

References:

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