

# Environmental Science: Atmospheres

GOLD  
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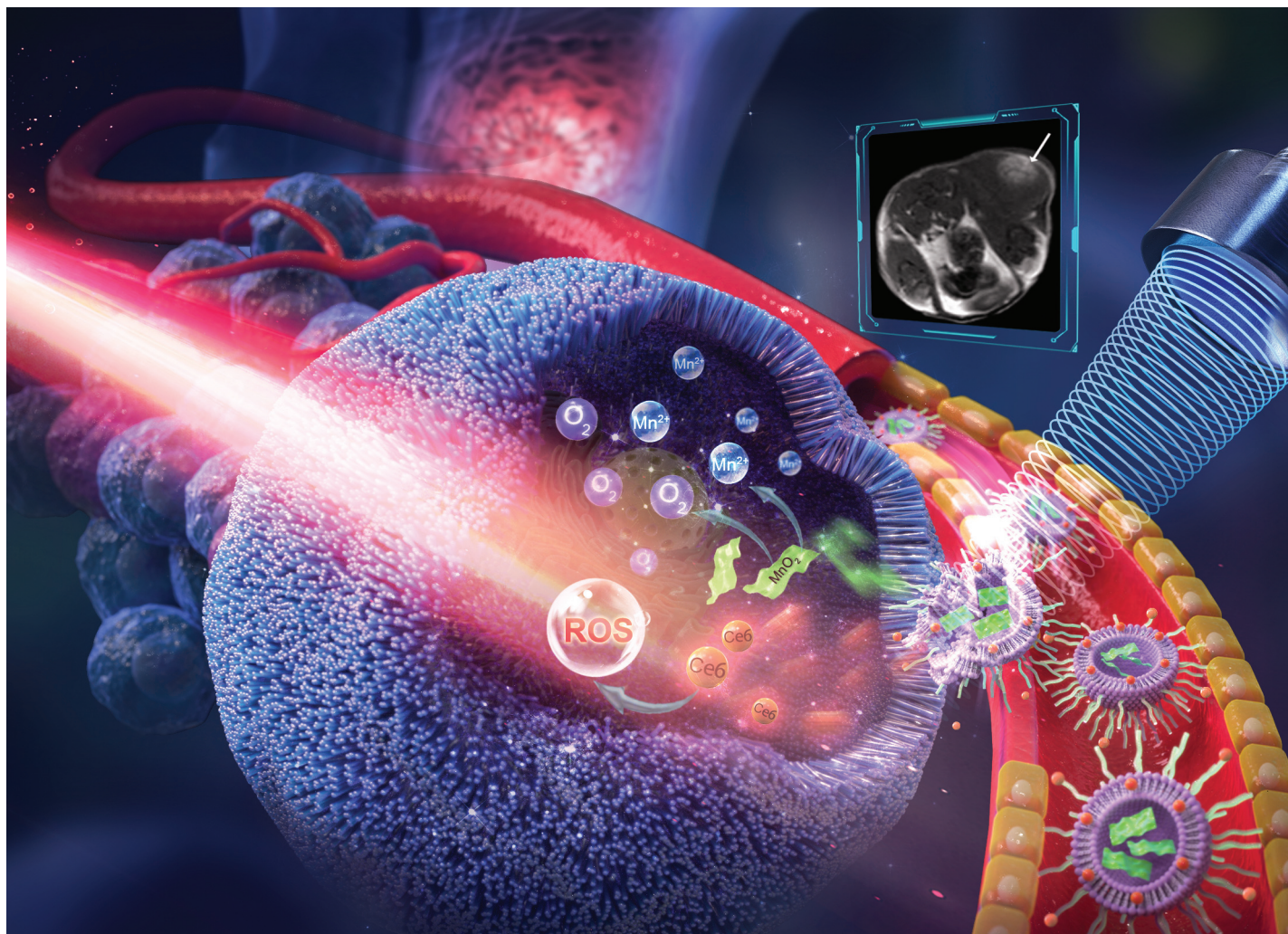
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Fundamental questions  
Elemental answers





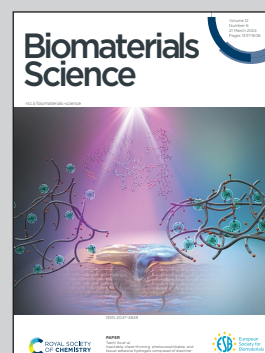


Showcasing research of Prof. Dr. Tingting Zheng, Prof. Dr. Xintao Shuai, Prof. Yun Chen, Prof. Li Liu and Prof. MD. Desheng Sun's Cooperative work from Shenzhen Key Laboratory for Drug Addiction and Medication Safety, Department of Ultrasound, Institute of Ultrasonic Medicine, Peking University Shenzhen Hospital, Shenzhen Peking University-The Hong Kong University of Science and Technology Medical Center, Shenzhen, China.

**MnO<sub>2</sub>/Ce6 microbubble-mediated hypoxia modulation for enhancing sonophotodynamic therapy against triple negative breast cancer**

Here, MnO<sub>2</sub>/Ce6 microbubbles associated with ultrasound and magnetic resonance technology were applied to achieve a non-invasive diagnosis and treatment method for malignant tumors in general. We focused on Triple negative breast cancer (TNBC). When ultrasound imaging detected tumor, MnO<sub>2</sub> and Ce6 nanoparticles were targeted released immediately by the cavitation effect of microbubbles. MnO<sub>2</sub> rapidly release Mn<sup>2+</sup> and O<sub>2</sub> upon encountering H<sub>2</sub>O<sub>2</sub> specific to malignant tumors. Mn<sup>2+</sup> yield in T1-weighted imaging with MRI. Meanwhile, O<sub>2</sub> can improve the oxygen-depleted state of the cancer microenvironment, and activate Ce6 to release reactive oxygen species (ROS) in combination with focused ultrasound (FUS) and/or laser. ROS lyse all biomacromolecular structures in cancer, killing it, which achieves the best effect of photoacoustic dynamic therapy. This study provides a new integrated preclinical theranostics scheme for TNBC treatment.

**As featured in:**



See Li Liu, Yun Chen, Desheng Sun, Xintao Shuai, Tingting Zheng *et al.*, *Biomater. Sci.*, 2024, **12**, 1465.