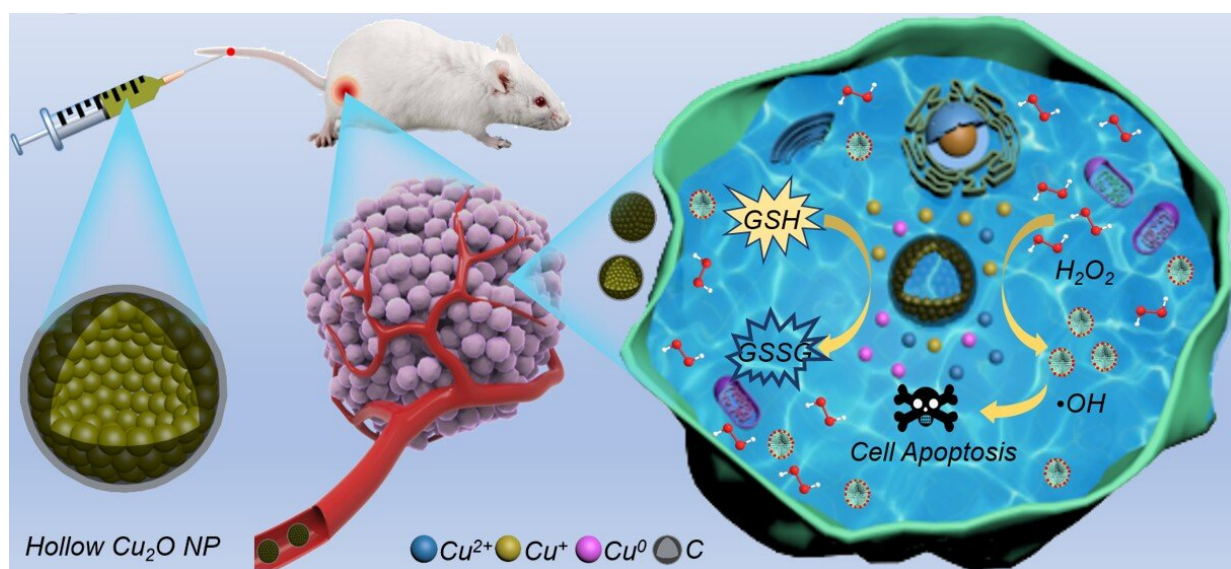


# 'Nanocapsules' provide new solution for efficient cancer chemodynamic therapy

March 14 2022, by Qian Yong and Zhao Weiwei



Schematic illustration of HCONC-catalyzed cascade reaction for chemodynamic oncotherapy. Credit: Wang Hui

In a paper published on *Small* recently, a collaborated research team led by Prof. Wang Hui from High Magnetic Field Laboratory, Hefei Institutes of Physical Science (HFIPS), Chinese Academy of Sciences (CAS) reported the synthesis of hollow cuprous oxide@nitrogen-doped carbon (HCONC) by one-step hydrothermal method as well as their applications in efficient chemodynamic therapy.

In recent years, chemodynamic therapy (CDT) responsive to [tumor microenvironment](#) (TME) has received extensive attention due to its low invasiveness and high selectivity. Among various metal-based nanocatalysts, the low redox potential of  $\text{Cu}^+/\text{Cu}^{2+}$  in cuprous-based nanocatalysts endows them with higher reactive oxygen species (ROS) yields and reduced glutathione (GSH) overexpression, which can also be shown great promise as a Fenton-like agent under relatively loose conditions. However, the susceptibility to oxidation and potential ionic toxicity of cuprous-based nanocatalysts severely limit their applications in nanomedicine. Therefore, it is necessary to develop a cuprous-based nanocatalyst with good biocompatibility to deplete the overexpression of GSH to enhance CDT.

In this research, researchers used a one-step hydrothermal method to synthesize HCONC nanocapsules for catalyzing the cascade reaction and improving the efficacy of CDT. This "nanocapsules" composed of nanoparticles is not "capsules" in the traditional sense. It is a core-shell structure formed by ingeniously attaching a thin layer of carbon to the surface of hollow cuprous oxide ( $\text{Cu}_2\text{O}$ ) nanocrystals, which not only effectively prevents the oxidation of  $\text{Cu}^+$ , but also increases stability of  $\text{Cu}_2\text{O}$  nanocrystals.

The  $\text{Cu}^+$ -mediated Fenton-like reaction in HCONC can efficiently catalyze  $\text{H}_2\text{O}_2$  to generate  $\cdot\text{OH}$ , and the  $\text{Cu}^+$  released in the TME can also decompose overexpressed GSH to protect nascent ROS.

Both in vitro and in vivo experiments show that HCONC has excellent antitumor ability without causing systemic toxicity. "The whole process can be described in a old saying," added Prof. Wang, "as the medicine took effect, the symptoms lessened."

**More information:** Xiangfu Meng et al, Hollow Cuprous Oxide@Nitrogen-Doped Carbon Nanocapsules for Cascade

Chemodynamic Therapy, *Small* (2022). [DOI: 10.1002/sml.202107422](https://doi.org/10.1002/sml.202107422)

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