Investigating the role of gold nanoparticle shape and size in their toxicities to fungi with a novel synthesis method

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With the flourishing development of nanotechnology, abundant amount of nanomaterials have been manufactured and applied in all sorts of areas in everyday life. Among which, gold nanoparticles (GNPs) possesses a certain proportion and very important status due to their fascinating properties like quantum size effects and wide applications in the fields of surface enhanced Raman scattering (SERS), chemical and biological sensing, biomedicine and so on. With such high usage in daily and industrial life, the release of GNPs into the environment is increasing in great quantities. Thus, attentions have been drawn to the effects of GNPs to the environment, especially the effects on living organisms, and ultimately the effects on human bodies and health. Unfortunately, the characteristics of the toxicology of GNPs on living organisms are still not fully understood up till now.

In our study, a novel synthesis method of shape and size controllable GNPs has been developed. And with such method, gold nanoflowers sized from as small as less than 1nm to ~60nm; along with mixtures of gold nanospheres and gold nanoplates from ~5nm to large aggregates of ~400nm has been synthesized to investigate the relationship of GNPs' toxicities with their size and shape. Fungi has been chosen for toxicity assessment due to their important role as decomposers in the ecosystem, which enables fungi to directly interact with the ecosystem and control its health condition. In our study, *Aspergillus niger, Mucor hiemalis, and Penicillium chrysogenum* were selected and exposed to the GNPs with designed size and shape and incubated for 48 hours before survival rates were examined and compared. Our results indicated that fungi species caused the largest variety of the tolerance to GNPs. Meanwhile, larger and non-spherical GNPs held higher toxicities.

Speaker Biography

Kangze Liu is currently a PhD student in Technological University Dublin, Ireland. She graduated from the Department of Hydraulic Engineering in Tsinghua University, China in 2015 and got BE in hydraulic engineering. Her current research focuses on the novel synthesis methods, characteristics and applications of gold nanoparticles. Her research topics include but not limited to: Establishment and evaluation of nanotest as a detection method of human fungal infections; evaluation of cold atmospheric plasma (CAP) for brain cancer treatment; establishment of a bottom-up in situ synthesis method of GNPs using phosphates and evaluation of its toxicity; establishment and evaluation of digital nanotest as a smart microbial detection system for water monitoring. Up till now, she has 3 papers published in international peer-reviewed journals, and 1 published book chapter. She is also a reviewer and has reviewed 8 papers for journals on MDPI.

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