Smart nanosystems based on gold nanoclusters for cancer therapy and bioimaging

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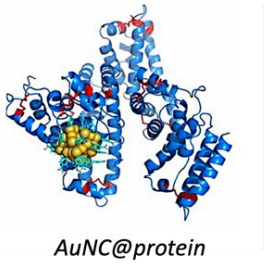
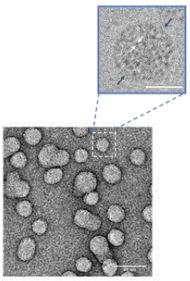
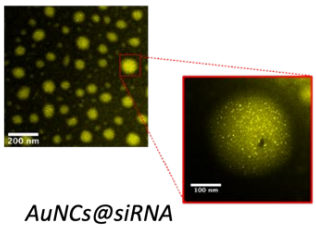
Multimodal nanosystems offer great promise for the early detection and the treatment of various cancers. Ultra-small gold nanoparticles called gold nanoclusters (AuNCs) with size lower than 3nm exhibit remarkable properties for their detection in vivo thanks to their photoluminescence in the broad infrared region (NIR-I :700-900nm; NIR-II: 900-1700nm) and the ability to activate them by light or X-ray to treat cancer[1]. In this context, with the expertise of producing a large library of AuNCs with tunable optical and physico-chemical properties, we designed different smart engineered nanosystems based on AuNCs. We demonstrated the ability to functionalize AuNCs with active molecules, to specifically labeled protein with single atomically precise AuNCs and to assemble AuNCs using polymeric and siRNA scaffolds in order to develop nanosystems with enhanced optical capacity, targeting cancer cells, and deliver molecules of interests. We investigated the behavior of these smart nanosystems in cellular environment and then explore their application as theranostic agents for in vivo bioimaging[2], radio/phototherapy[3, 4] and optical guided surgery[5].



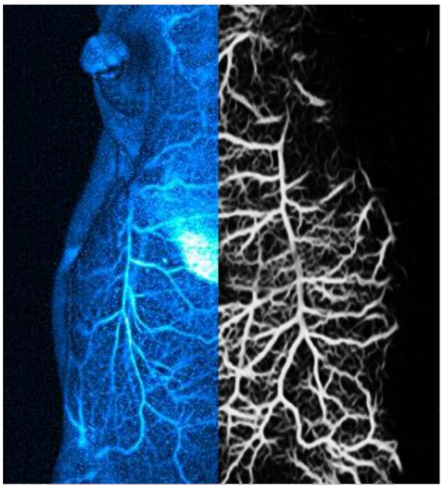
AuNC@protein



AuNCs@polymeric NPs



AuNCs@siRNA



References

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2. Z. Yu *et al., ACS Nano* **2020,** *14* (4), 4973-4981.
3. Y. Kong *et al.*, *Materials Today* **2021,** *51*, 96-107.
4. M. Broekgaarden et al. *Nanoscale* **2020,** *12*, 6959-6963.
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