

Joint Meet on  
29<sup>th</sup> International Conference on  
**Nanomedicine and Nanomaterials**  
&  
**24<sup>th</sup> World Nanotechnology Congress**  
April 26, 2021 | Webinar

### **Ferromagnetism of thiol-coated gold nanostructures**

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The tumor-killing potential of gold nanoparticles via hyperthermia has shown great promise. While the optical properties of the nanoparticles are usually exploited, some have turned their attention to the possibility of heating under an alternating magnetic field. For the latter to work, an understanding of why gold nanoparticles may be magnetic, and how to tune the magnetism, is need first. Indeed, as ferromagnetism is commonly only found in iron and a few other metals and compounds, the fact that it is observed in nanosized gold has been a surprise. In this work, we study the magnetic and electronic properties of similarly-sized gold nanoparticles coated with four different n-alkanethiols, as well as hydroxyl- and carboxyl-functionalized alkanethiols, using superconducting quantum interference device (SQUID) magnetometry and ultraviolet photoelectron spectroscopy (UPS). We find room-temperature behavior hysteresis in all cases, as well as large magnetic anisotropy. We identify a correlation of increased magnetization with higher work function. We also observe magnetism in coated gold thin-films. This work establishes chemical handles to enhance magnetism in nanoscale gold particles.

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