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Au nanoparticles labeled with organic radicals

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A series of Au nanoparticles functionalised with high coverage of TEMPO-modified disulfide have been prepared and studied by EPR, UV-Vis, TEM microscopy, Energy Dispersive X-ray analysis (EDX) and Thermogravimetric Analysis (TGA). In order to increase the coverage of spin labels on the particle surface, heat-induced size evolution and ligand exchange reactions were used. A one-pot reaction at room temperature led to gold nanoparticles with a controlled large size (ca. 7 nm) and high coverage of radicals. These nanoparticles showed a $|\Delta ms| = 2$ transition at half-field which gives direct evidence of the presence of a high-spin state and allows an EPR study of the nature of the magnetic coupling between the spins. The results showed dominant antiferromagnetic interactions between radicals but at lower temperatures a ferromagnetic contribution was observed. The same diradical has been studied in solution, crystal and anchored to Au (111) flat surface showing anisotropic magnetic properties. We have also synthesized gold nanoparticles functionalized with high coverage of nitronyl nitroxide radical that preserve the same thermally modulated spin exchange radical interaction observed for the diradical in solution. This result has significant importance for developing functional hybrid surfaces and opens the possibility to be used as a new class of spin markers.

Biography

J Vidal-Gancedo is a Tenured Scientist at the Materials Science Institut of Barcelona, ICMAB-CSIC and Researcher at the Networking Research Center on Bioengineering, Biomaterials and Nanomedicine (CIBER-BBN), Barcelona, Spain. He obtained a PhD in Chemistry from the University of Barcelona in 1993. Actually also he is Scientist In-Charge of the ICMAB Electron Paramagnetic Resonance Laboratory and President of The Spanish Electron Paramagnetic Resonance Group, GERPE. His research interest focuses on molecular functional materials based on organic radicals, molecular nanoscience, and nanomedicine. He authored of more than 145 journal papers in peer reviewed journals including several book chapters and 3 patents. His work have received more than 3000 citations and his h factor actualy is 31.

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