

Assessment of the paper *Preparation and characterization of dendrimer-gold colloid nanocomposites* by Gracia et al, Anal Chem 71 (1999) 256-258.

1. What is, in your own words, the main issue of the paper?

The paper describes a new way to make gold nano-particles using poly(amidoamine) dendrimers by reduction of HAuCl_4 in the presence of these molecules which are regular star polymers. The dendrimer is claimed to stabilize the gold nanoparticles by forming a monolayer on their surface, probably by electrostatic repulsion.

2. What are the main claims or conclusions of the paper?

The main claim that is made is that gold nanoparticles can be made with the help of dendrimers and that their size decreases with generation.

3. Are the scientific / experimental arguments provided in the paper sufficient to support the conclusions? Are there flaws in the reasoning?

There is a serious flaw in the argumentation as can be clearly observed from figure 2 in the paper. The left panels refer to the nanoparticles that are synthesized with the smaller G2 dendrimer and the right panels refer to the particles synthesized with the G4 dendrimer. It is clear both from the TEM-micrograph and the size distribution that the majority of the particles made with the G2 dendrimer are highly aggregated and that the size of the primary particles is around 2.3 nm. The nanoparticles made with the G4 dendrimer are larger and also show less aggregation. The aggregation of the nanoparticles made with the G2 dendrimer is probably due to the, in the paper mentioned, more open structure of this molecule.

There are two ways in which the final particles can appear: either the gold nanoparticle resides within one dendrimer molecule or the nanoparticle is coated with dendrimer. Both ways are possible, given the dendrimer dimensions provided in the paper. The proofs that are provided to support the latter picture that is favoured by the authors are not convincing. In both cases the FT-IR spectrum could contain the amide peaks at the indicated positions. Likewise, the surface-plasmon resonance would shift in the observed direction. This together with the evidence provided with the TEM-micrographs and the size distributions leaves both options open. Personally, I favour the first alternative because of the higher degree of coordination that is available for the gold.

4. If you were to decide on the future direction of a company for which the results of this paper could be relevant, would you (a) discard the paper, (b) try to find an academic group that would further investigate the claims of the paper, (c) have some of your own research team further investigate the usefulness to your company, or (d) immediately try to adapt the processes in your company to implement new technology? Provide the arguments for your decision, thereby noting the increase in investment and in risk of the four choices.

The synthesis method is sufficiently interesting to follow up, but the cost of the dendrimer must be associated with better performing nanoparticles. Also, many issues of the synthesis need to be worked out in further detail in view of the doubts formulated above. Therefore, a project in this field with another academic group specialized in this matter would be the way to go according to me.