

SYNTHESIS AND PROPERTIES OF METALLIC CLUSTERS BY SOFT CHEMICAL ROUTES

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A novel procedure for the production of metallic clusters based on a recent patent¹ will be presented. As an example of the possibilities offered by those techniques the preparation of specific clusters of Ag and Au with interesting optical, fluorescent, and magnetic properties will be shown.

Fig.1

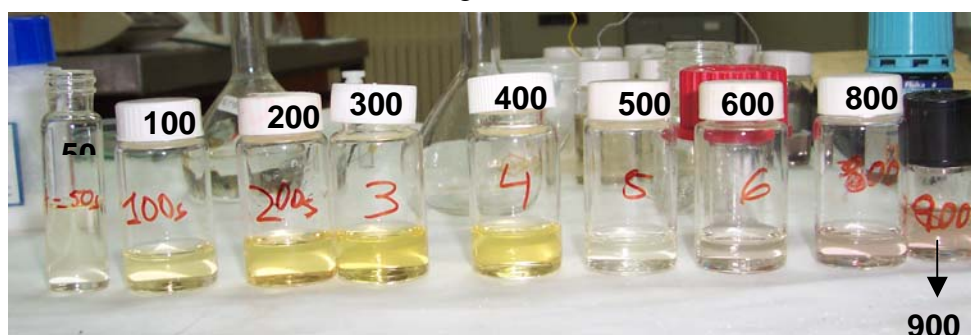
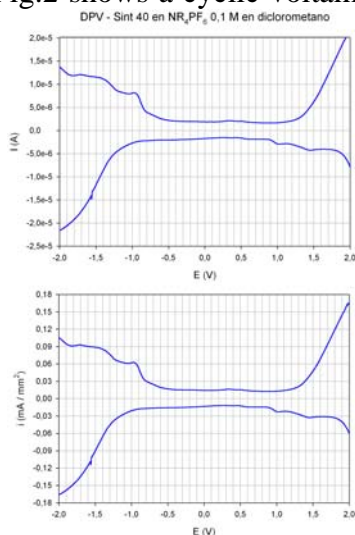


Fig. 1 shows Au clusters of different sizes (clearly distinguished by their different colours) obtained by an electrochemical procedure based on previous works^{2,3} stopping the synthesis at different reaction times.

Fig.2

Fig.2 shows a cyclic voltammometry of Au clusters showing a remarkably large HOMO-LUMO gap (about 2eV) characteristics of an Au cluster with a small number of atoms (10-13). This gap is larger than the gap in C₆₀ (1.57eV) and the recently reported tetrahedral Au₂₀ cluster (1.77eV)⁴. This implies that these small clusters are highly inert and stable, being optimal candidates for catalysis because almost all the atoms are susceptible to bind different molecules like CO, O₂, CO₂, H₂O, etc. Preliminary reports on catalytic properties of these clusters will be reported elsewhere.



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¹M.A. López Quintela and J. Rivas. "Procedure for the preparation of atomic quantum clusters". Spanish patent application No.P200402041, 2005.

²Rodríguez-Sánchez ML, Rodríguez MJ, Blanco MC, Rivas J, López-Quintela MA. J.Phys.Chem.B 2005, 109, 1183-1191.

³M.L. Rodríguez-Sánchez, M.C. Blanco, M.A. López-Quintela. J.Phys.Chem.B 2000, 104, 9683-9688.

⁴J.Li, X.Li, H-J. Zhai, L-S.Wang, Science, 2003, 299, 864-867.