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Core/Shell Bimetallic and Trimetallic Nanoclusters

A core/shell metallic microstructure usually refers to a metal bound, for example, to a polymer, dendrimer or carbon nanostructure of colloidal dimensions (~ 1–1000 nm). Such structures are usually monometallic and have interesting properties, such as combined heterogeneous and homogeneous catalytic properties. However, there are bimetallic core/shell clusters where one metal is the core, and the second forms a shell around the first. Until recently these structures and their properties had not been examined.

Two recent papers from the Science University of Tokyo in Yamaguchi, Japan, (N. Toshima, *Pure Appl. Chem.*, 2000, **72**, (1–2), 317–325), and from the University of Notre Dame, U.S.A., (A. Henglein, *J. Phys. Chem., B*, 2000, **104**, (29), 6683–6685) discuss the preparation of core/shell bi- and trimetal nanoclusters.

In the first paper colloidal core/shell bimetal dispersions were prepared from mixtures of two of $HAuCl_4$, H_2PtCl_6, $PdCl_2$, $RhCl_3$ and $RuCl_3$. The metal ions were reduced simultaneously by alcohol under mild conditions in the presence of the protective polymer poly(N-vinyl-2-pyrrolidone), PVP. The reaction occurred in stages, first by metal ion coordination, then their reduction to metal atoms or microclusters, next coagulation of one type of atom or microcluster to form core clusters, and lastly deposition of the second metal atoms or microclusters onto the core clusters to form shells. Structures are controlled by the reduction potential of the metal ions and the coordinating ability of the metal atoms or microclusters to the PVP. In this way core/shell clusters of Pt/Ru, Au/Pt, Au/Pd and Au/Rh of diameters ~ 1.9–2.6 nm were produced. When tested for visible-light-induced electron transfer, the bimetallic Pt/Ru nanoclusters had the higher catalytic activity.

The second paper describes a radiolytic method to produce Pd/Au and Pd/Au/Ag bi- and trimetallic colloids. Hydrogen reduction of $PdCl_4^{2-}$ at room temperature gave Pd nanoparticles. Gold shells (from $K_2Au(CN)_2$), and silver shells (from $NaAg(CN)_2$) were then deposited. Colloidal structures and absorption spectra were examined.

The Foundation of the Metric System in France in the 1790s

In the July 2000 issue of *Platinum Metals Review* on page 125, the date on which the platinum metre and the platinum kilogramme were deposited in the French National Archives should be 22nd June 1799, not 22nd July 1799.