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The Authors

Ted B. Flanagan is Professor of Chemistry at the University of Vermont, U.S.A. His main interests are the thermodynamics of metal hydrogen systems and H-induced lattices changes.

R. Balasubramaniam is Associate Professor of Materials and Metallurgical Engineering at the Indian Institute of Technology, Kanpur, India. His interests include the effect of H on materials and archeological metallurgy.

R. Kirchheim is Director of the Institut für Materialphysik, Göttingen, Germany. His main interests encompass the physics of materials with special interest in the role of H in characterising defective and nanosized metals and alloys.

Sonochemical Preparation of Nano Platinum and Palladium

Ultrasound offers an attractive route for preparing metal nanoparticles: rapid reaction rate and very small particle formation. Ultrasound can create acoustic cavitation (formation, growth, and implosion of bubbles) in a liquid. When cavitation bubbles collapse areas of high pressure and high temperature (hot spot > 5000 K) are generated. This can decompose the molecules in the bubbles. The hot-spot temperature depends on the properties of the gases inside the bubble – another gas may produce a different effect. Nanoparticles prepared by sonochemical reduction generally have wide size distributions. Attempts at controlling particle size and size distribution have used different metal concentrations, surfactant types and coexisting alcohol types.

Researchers in Japan have now investigated the effect of different atmospheric gases on the particle size distribution of Pt and Pd nanoparticles prepared by the sonochemical reduction of H_2PtCl_6 or K_2PdCl_4 solutions, respectively (T. Fujimoto, S. Terauchi, H. Umehara, I. Kojima and W. Henderson, *Chem. Mater.*, 2001, **13**, (3), 1057–1060). Poly(*N*-vinyl-2-pyrrolidone) was the protecting agent. A smaller, sharper size distribution was achieved for Pt particles prepared under Xe. Pd nanoparticles prepared under N_2 had a sharp size distribution. An optimum sonication time is necessary for preparing single-dispersion nanoparticles. The reaction rate, depending on the hot-spot temperature, is controlled by changing the dissolved gas.