SYNTHESIS AND CHARACTERIZATION OF IRIDIUM NANOPARTICLES OBTAINED BY BIOREDUCTION WITH ALFALFA

Gerardo Canizal[1], Pablo S. Schabes-Retchkiman[2,] Carlos Chavez-Baeza[1] y HongBo Liu[3]

[1]Programa de Energía, UACM, San Lorenzo No. 290, Col. Del Valle, D.F., C.P. 03100, México.
[2]Instituto de Física, UNAM, Apartado Postal 20-364, D.F., C.P. 01000, México.
[3]Instituto Mexicano del Petróleo. Lázaro Cárdenas No. 152, Col San Bartolo Atepehuacan, D.F., C.P. 07730, México.

The synthesis of transition metal nanoparticles is a research area of big interest, especially since these materials have very interesting optical, magnetic and catalytic properties. Commonly transition metal nanoparticles are synthesized by physical or electrochemical methods, which imply high costs in the synthesis of these types of nanoparticles; Biosynthesis processes in water represent an alternative for the physical or chemical synthesis, since the biomass of different plants has shown to provide an efficient molecule to reduce the metal ions from valence +3 to nanoparticles with valence 0, and passivate the ions contained in the solution.

In this work the synthesis of metallic Iridium nanoparticles through bio-reduction methods is reported here for the first time, through a facile, environmentally friendly method. The main controlling parameter was the pH used in the sample preparation, which controls the size, shape and finally structure of the grown particles. High resolution electron microscopy was used in order to determine the structure of individual nanoparticles. The structure and stability of the Iridium clusters (up to 4000 atoms) were determined through the calculation of minimum energy configurations using molecular and quantum mechanics approximations. The usual structures observed for the obtained nanoparticles, were fcc-like and multiple twinned. The size controlled synthesis of small iridium nanoparticles in the quantum-dot range has been successfully demonstrated