Colloidal Pb nanoparticles were obtained using the extract of the wild plant *Opuntia ficus-indica*. Optical, structural and vibrational properties of the nanoparticles were considered in this study. Two absorption bands in the Ultra Violet/Visible (Uv/Vis) spectrum were detected after the synthesis and stabilization of Pb nanoparticles. Such bands were located in 230 and 298 nm and are associated with the surface plasmon of Pb nanoparticle. The morphology and structural parameters of nanoparticles were studied using the transmission electron microscopy (TEM). The obtained nanoparticles have spheroidal morphology and size ranging from 2-8 nm. Predominant particle size is located at 4 nm. Interplanar distances were detected in a high resolution TEM image, corresponding to levels of lead in bulk. Raman Spectroscopy measured in colloidal nanoparticles shows a vibrational band located at low wavenumbers around 116 cm$^{-1}$. Other authors have reported vibrational modes associated with small clusters of Pb located between 108-123.1 cm$^{-1}$ [I-III]. The Density Functional theory (DFT) and semi-empirical methods was additionally employed to predict the vibrational modes in small cluster of Pb, these theories found a great approximation with those obtained experimentally.

**Keywords:** Pb Nanoparticles, Opuntia ficus-indica, DFT calculations

**References:**


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