

Green Nanotechnology Approach in Manufacturing of CaCO₃ Nanoparticles from Eggshell

* Dahlia Davoudi

* Corresponding Author: dahlia.davoudi17@gmail.com
School: Farzanegan 1, Karaj

Received : 27/10/2016 Accepted : 27/12/2016

Introduction

Nanotechnology is a broad term that refers to all the advanced technologies in the field of work at the nano scale. Green nanotechnology is the study of how nanotechnology can benefit the environment such as by using less energy during the manufacturing process, the ability to recycle products after use and using eco-friendly materials. Eggshell is a part of waste products which is found in household and industrial waste in abundance and despite its low value, its biocompatible calcium carbonate in nano scale can produce a great value added.

Results and Conclusion

In this study, a green, top-down procedure for making CaCO₃ nanoparticles from eggshell was investigated. Waste eggshells were used as a raw material to produce high surface area biocalcium carbonate nanoparticles using a combination of mechanical and ultrasonic irradiation techniques. High resolution transmission electron microscopy (HR- TEM) and X-ray analysis showed that the synthesis process was effective and yields only CaCO₃ nanoparticles with high porosity.

Coarse powder gained from hot water treatment followed by grinding was passed from a leach at size of about 300-400 microns. In the next step colloidal particles in a solution of distilled water were repeatedly exposed to a programmable ultrasonic homogenizer device. Particle size was determined using a DLS Particle Size Analyzer. The samples were centrifuged to remove large particles

and samples supernatant were then converted into powder by freeze-drying. The final powder was characterized by UV-Visible and DLS size analyzer. The results showed that sizes of the particles were in micrometer scale after grinding but were below 100 nano meter after ultrasonic and centrifuge. Nano calcium carbonate powder in this study was produced without the use of any chemical substance and from this aspect; it can be called green nanotechnology.

References

- 1-Babou-Kammoe, R.Safia HAmoudi, Fical Larachi and Khaled Belkacemi,. Snthesis of Caco3 nano particle by cotrolled precipitation of saturated carbonate and calcium nitrate aqueous solution,. The Canadian jornal of chemical engineering ,vol90,pp26-34,2012.
- 2-Maleki Dizaj, Solmaz. Mohammad, Barzegar-Jalali. Mohammad Hossein, Zarrintan. Khosro, Adibkia. Farzaneh, Lotfipour. 2015. Calcium Carbonate Nanoparticles; Potential in Bone and Tooth Disorders. Pharmaceutical Sciences, 20, 175-182.
- 3-Manjusha Hariharan,Varghese Neethumol, A. Benny Cherian, P.V. Sreenivasan, Paul Jenish, Asmy Antony. K.A, 2014. Synthesis and Characterisation of CaCO₃ (Calcite) Nano Particles from Cockle Shells Using Chitosan as Precursor. International Journal of Scientific and Research Publications, Volume 4, Issue 10, 2250-