V Iberoamerican Chitin Symposium
Iberoamerican Chitin Society
March, 2010, Santiago, Chile

SELECTIVE CRYSTAL GROWTH OF $CaCO_3$ USING COUPLED CHITOSAN-*g*-POLYSILOXANE COPOLYMERS WITH GOLD NANOPARTICLES AS NOVEL TEMPLATE

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It is well known that, polydimethylsiloxanes (PDMS) are silicone compounds with different medical applications [1]. Although, there are abundant articles on the production of modified PDMS, few reports exist regarding the use of functionalized PDMS on the crystal growth of calcium carbonate ($CaCO_3$). $CaCO_3$ is one of the most abundant biominerals in nature, and can be grown easily under laboratory conditions. The biological crystallization (biomineralization) is the process by which living organisms exert control over minerals they deposit, creating materials with remarkable morphologies and superior properties [2]. Therefore, the molecular processes and materials that control such crystal nucleation and growth are of great interest to materials scientists who seek to manufacture composite materials and crystalline forms analogous to those produced by nature. There are several approaches to explore the effect of different templates on *in vitro* inorganic crystallization. Additionally, many approaches have been used to synthesize a specific form of $CaCO_3$ such as films, spheres, sponge, ligand-receptor complexes, block copolymers, synthetic polypeptides and grafted polymers, etc. The present work is motivated by scarcity of reports on the effect of functionalized PDMS and coupled PDMS copolymers for the control of $CaCO_3$ crystallization. We report the synthesis and characterization of coupled chitosan to anionic dimetilsiloxane-co-methylsiloxane copolymers (CHI-g-CO_2HPDMS) to gold nanoparticles (AuNP) and its effect on $CaCO_3$ crystallization. The *in vitro* crystallization was performed using a gas diffusion method. SEM analysis of $CaCO_3$ obtained with CHI-g-CO_2HPDMS showed different $CaCO_3$ crystal morphologies as a function of pH. XRD demonstrated two polymorphs: calcite and vaterite.

The Fig. 1 shows the TEM picture of coupled CHI-g-CO_2HPDMS copolymers to AuNP at different ratios of CHI-g-CO_2HPDMS to AuNP. Fig. 2 shows SEM-EDS analysis obtained on the $CaCO_3$ in the presence of AuNP solution. Fig.2a shows the SEM of aragonite crystals of 10 µm in size formed with AuNP solution. Fig.2b shows the elemental composition on the aragonite demonstrating the presence of Au atoms adsorbed on the aragonite surface. The determination of the concentration of Au of coupled CHI-g-CO_2HPDMS**,** and the CHI solution was 6.26 µg and 3.77 µg respectively. The Au determination was performed by instrumental neutron activation analysis (INAA).

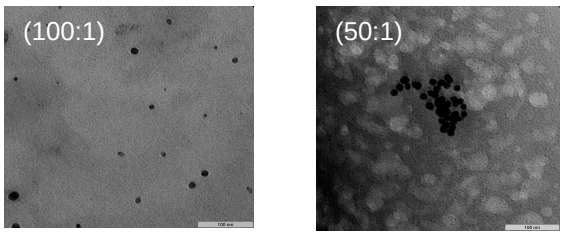

Fig.1. TEM of AuNP determined from the coupled CHI-g-CO_2HPDMS at different ratios.

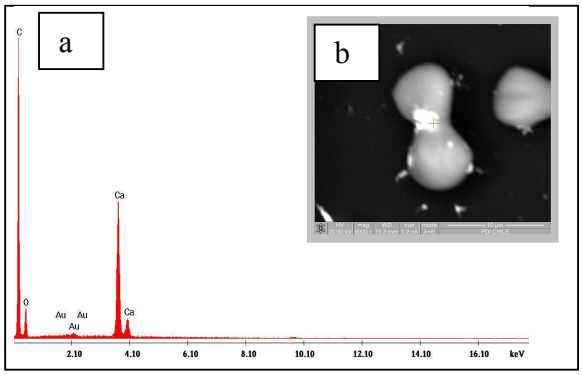

Fig. 2. SEM-EDS of $CaCO_3$ crystals grown in the presence of AuNP.

SEM-EDS and XRD of $CaCO_3$ crystals grown in presence of coupled CHI-g-CO_2HPDMS are under progress. The use of modified PDMS as template provides a viable approach for studying various aspects of biomineralization like controlled particles, polymorphism and crystals morphologies.

ACKNOWLEDGEMENTS

This research was supported by Fondecyt 11070136, Proyecto VID ENL 10/02 of the University of Chile and Fondap 11980002

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