Abstract No: 385 ***Natural Sciences***

STEARIC ACID-COATED CALCIUM CARBONATE NANOCRYSTALLITES FROM DOLOMITE

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Fatty acid-coated calcium carbonate (FACC) is highly compatible with polymers than the bare calcium carbonate. Therefore, FACC is extensively used as a filler in industries, such as, rubber, plastic, paint, textile and sealant. As a filler, nanoparticles are more effective than micrometer- and millimeter-size particles. However, currently, FACC is synthesized from rocks made of calcite, and from commercial calcium and carbonate salts. Calcite rocks are limited and commercially available salts are also relatively expensive. Therefore, identification of cheap and readily available raw-materials and their use to produce FACC in low-cost methods are a timely needed requirement to fulfill the current demand of FACC. Herein, our aim is to devise a simple, economical and a novel method to synthesize stearic acid-coated calcium carbonate nanocrystallites from commonly available dolomitic marbles via the so-called carbon dioxide bubbling technique. In this method, powdered dolomite (particle size less than 100 µm) was heated at 900 °C, for 3 hrs, to produce calcined dolomite (CaO.MgO) as usually done in conventional lime industry. The calcined dolomite (5.00 g) was then added to 1 M sucrose solution (50.0 mL) to produce calcium sucrate. Stearic acid (0.284 g dissolved in 10.0 mL of absolute ethanol) was added to the calcium sucrate solution, while stirring. Carbon dioxide gas was bubbled, through the mixture of calcium sucrate and stearic acid, to synthesize stearic acid-coated calcium carbonate nanoparticles. The precipitated product was collected, by centrifuging, and then, it was air dried for 24 hrs. Fourier Transform Infrared (FT-IR) spectroscopic studies confirmed that the stearic acid was well coated on calcium carbonate. The powder X-ray diffraction data (PXRD) showed that the product was composed only of the calcite form of calcium carbonate. By applying the Debye-Scherrer formula, to the major peak of PXRD, the crystallite size of the calcite was estimated to be 41 nm. Therefore, the proposed method is very successful to synthesize stearic acid-coated calcium carbonate nanocrystallites from cheap and mundane dolomitic marbles to enable to fulfill the current industrial demand.

Financial assistance given by the National Research Council (Grant No. 11-178), Sri Lanka, is acknowledged.