PO-10

MICROWAVES EFFECTS ON ARAGONITE PARTICLES FORMATION FROM SOLUTION

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During the last two decades it was stated by a large number of scientific publications [1] that microwave technology is an efficient and suitable tool in the synthesis and processing of materials. Moreover the interactions of materials with the high intensity of the magnetic field generated by microwave radiations could favour the required process. Aragonite is one of the polymorph of calcium carbonate. Its needle-like crystals are used as fillers for the improvement of the mechanical properties of paper and polymer materials [2]. Aragonite is also a good biomedical material because it is denser than calcite and can be integrated, resolved and replaced by bone [3]. The aim of the work is that to observe the effect of intense electromagnetic fields generated inside multimodal microwave applicators of he crystallization of the calcium carbonate polymorphs starting from calcium bicarbonate solutions. Identification of the calcium carbonate polymorphs has been achieved by XRD and IR analyses. SEM analysis has been performed to investigated the morphology of calcium carbonate samples. Preliminary tests have been conducted at atmospheric pressure and adjusting microwave power in a such way to reach a temperature between 80 °C and 90 °C and which was maintained for at least 1200 seconds. These experiments have demonstrated the relevant effect of microwaves of favouring aragonite formation with increasing exposure time as shown in Figure 1. For sake of comparison calcium carbonate powders have also been synthesized via conventional heating either in a stove or on a heated magnetic stirrer. Results were finally compared to those obtained in high intensity magnetic fields.

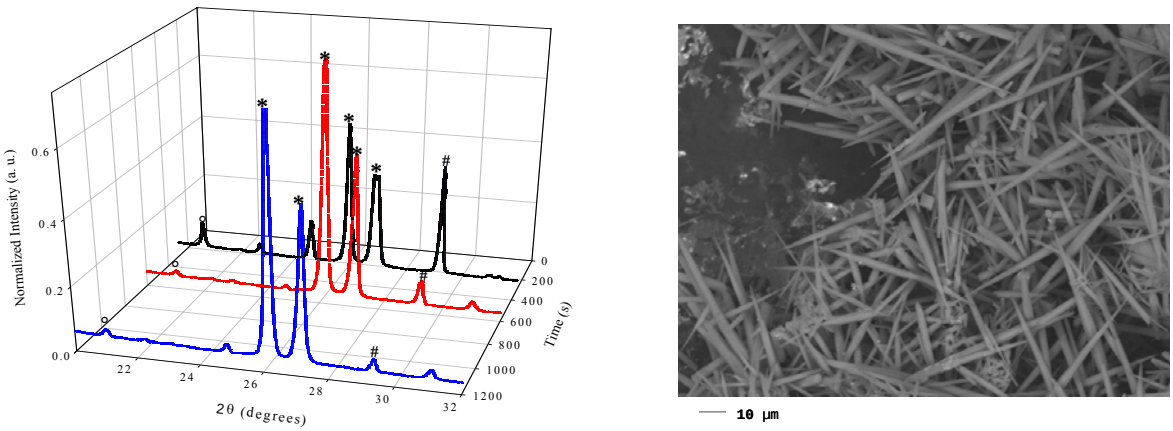

Figure 1. *Left*: XRD spectra of calcium carbonate samples (* aragonite, # calcite, º vaterite) at different microwave exposure times. Method: 300 W for 220 sec, 50 W for: 300 sec (black line), 600 sec (red line), 1200 sec (blue line). *Right*: SEM image of the sample with higher content of aragonite corresponding to the XRD blue line spectrum.

References

[1] A. Loupy, Microwaves in Organic Synthesis, Second Edition, July 2006, ISBN 3-527-31452-0 - Wiley-VCH, Weinheim.