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Microstructural and chemical characterization of hydroxylapatite obtained from sandollar and monetite by electron microscopy

V. Rodríguez-Lugo*, C. Angeles-Chavez**

*Instituto de Física Benemérita Universidad Autónoma de Puebla Apartado Postal J-48 Puebla 72570, México.
**Instituto Mexicano del Petroleo, Programa de Investigacion y Desarrollo de Ductos, Eje Central Lazaro Cardenas 152, 07730 México D.F.

The hydroxylapatite crystals are considered as biomaterials due to the high biocompatibility with the osseous tissue [1]. Currently it is being a very important necessity, to obtain hydroxylapatite crystals to low cost. The sand dollar (mellita eduardobarrosoi sp. Nov.) is a rich source of calcium carbonate and can be used as a low cost precursor.
Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) are important tools to characterize this material type because we can investigate their morphological, chemical and structural characteristic to determine the specific application.
In this work, hydroxylapatite was synthesized through a hydrothermal process using a stoichiometric ration of sand dollar [2] and monetite as precursors in a reaction time of 2, 4, 6, 8, 10 and 20 hr. At 20 hr was determined as better reaction time [3,4]. Also, the synthesis was explored with different CaO concentration. Hydroxylapatite, whitocklite, portlandite and monetite were the main crystalline phases identified. The morphological characteristics in the samples were observed by SEM. Figure 1a shows a typical morphology observed in the stoichiometric sample sustained during 20 hr of reaction. The crystals are observed as fibbers which correspond to the hydroxylapatite phase. Figure 1b illustrates the morphology obtained with the lowest CaO concentration. In this case, small particles were observed as agglomerated . Other morphology types were observed in the samples with an excess CaO. TEM was used to identify the morphology, crystalline structure and chemical composition of the single hydroxylapatite crystals. These are illustrated in figure 2. The hydroxylapatite crystals found, they had a shape of fibber (figure 2a). Electron diffraction patterns obtained from these morphologies showed some forbidden reflections (Figure 2b). Small amount of Si and Mg were detected in the chemical analysis of the crystals (figure 2c). Simulation study was carried out to explore the forbidden reflection and it found that Si and Mg play a important roll in the hydroxylapatite structure.

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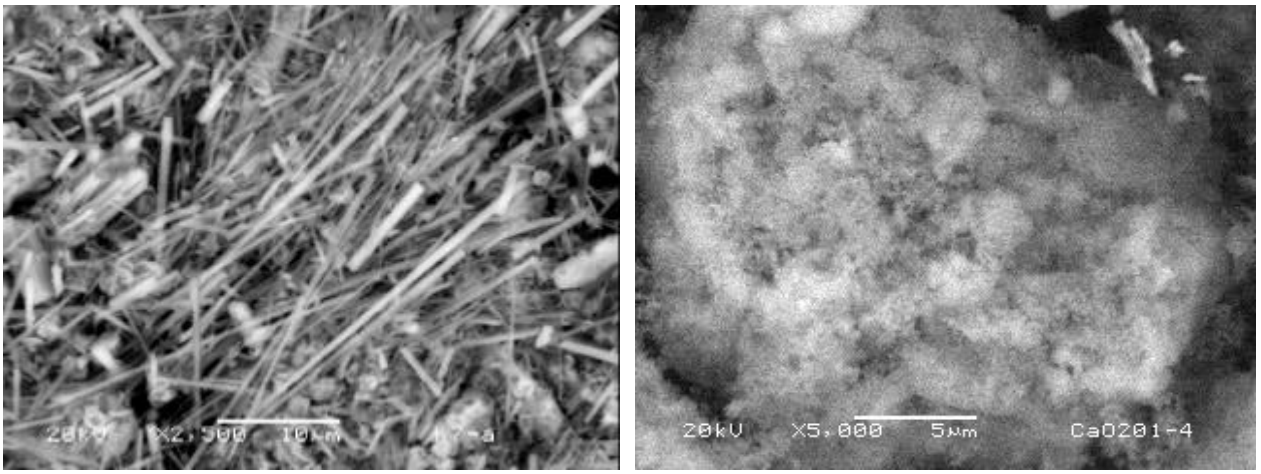
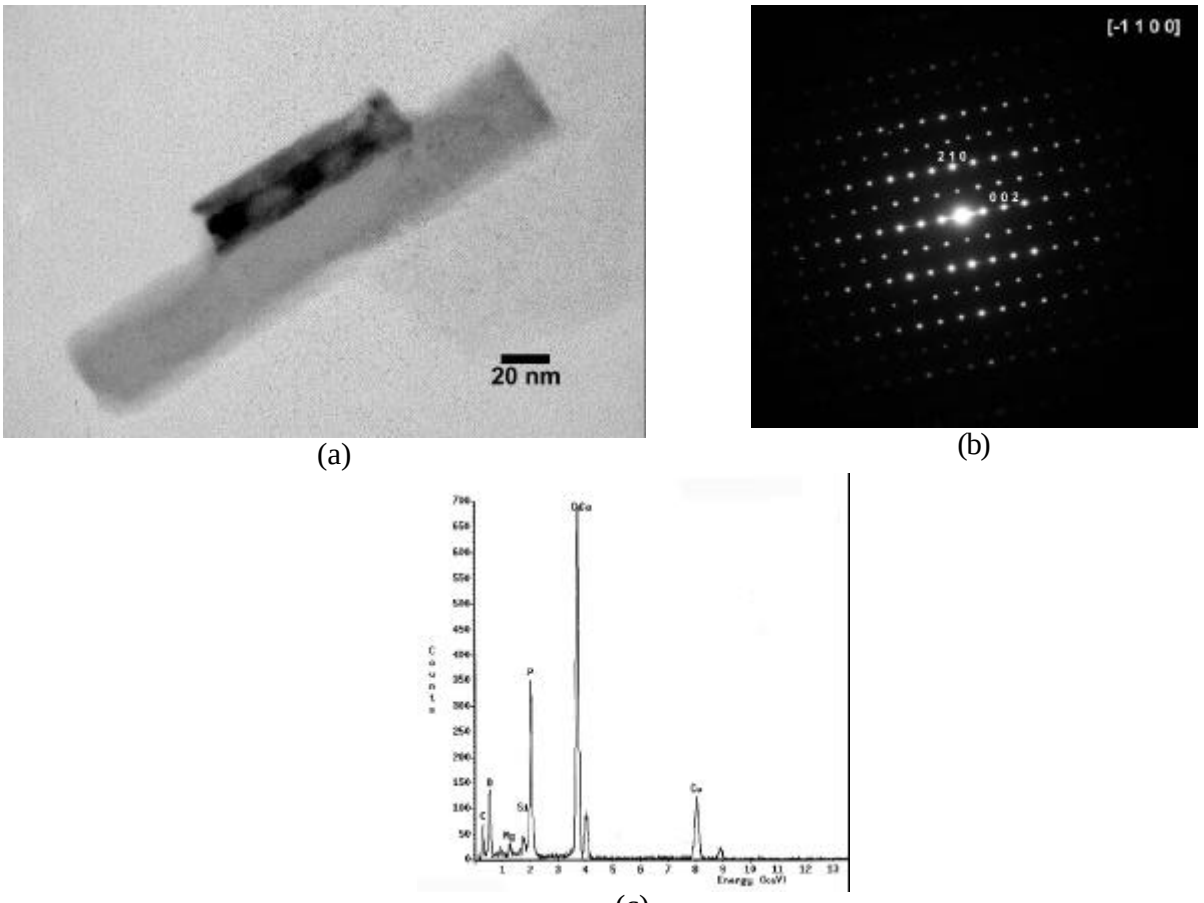


(a) (b)

Figure 2. SEM image showing typical morphology observed a)stoichiometric ratio during 20 hr of reaction and b)sample corresponding to the lowest CaO concentration.



(a) (b)

(c)

Figure 2. TEM image illustrating a)typical morphology of the hydroxylapatite crystals b)electron diffraction pattern obtained from this morphology and c)typical chemical composition of the hydroxylapatite crystals.

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