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File name:	3._Synthesis_of_hydroxyapatite.pdf
File size:	372.87K
Page count:	8
Word count:	2,932
Character count:	15,796
Submission date:	07-Apr-2022 07:30PM (UTC-0700)
Submission ID:	1804853866

The 6th Annual International Seminar on Trends in Science and Science Education IOP Publishing
IOP Conf. Series: Journal of Physics: Conf. Series **1462** (2020) 012058 doi:10.1088/1742-6596/1462/1/012058

Synthesis of hydroxyapatite from limestone by using precipitation method

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Abstract. Hydroxyapatite from limestone was synthesized by precipitation method. During the synthesization the temperature of a 200 mesh sample was increased to 600°C for 3 hours. It was transformed $CaCO_3$ into CaO powder. Then the CaO powder was dissolved with water to get $Ca(OH)_2$, then it dissolved with H_3PO_4 0.3M as a source of phosphate. The solution was mixed by using magnetic stirrer with a speed of 300 rpm for 1 hour. Then NH_4OH 1M solution was periodically dropped to that the solution until it became an alkaline with pH 10. The solution was stood for 24 hours and the precipitate was dried by using an oven at 120°C for 5 hours. Hydroxyapatite powder obtained was characterized by FTIR to see the major functional groups that are formed in hydroxyapatite limestone. The results obtained were 3 functional major groups that are phosphate (PO_4^{3-}), carbonate (CO_3^{2-}) and hydroxyl (OH^-) in hydroxyapatite limestone.
Key Words: Hydroxyapatite, Limestone, Precipitation Method, FTIR.

1. Introduction
Hydroxyapatite synthesis calcium is needed to quite high calcium as a biological source as its basic material. There are several ingredients that can be used to make hydroxyapatite such as fish bones [1], eggshells [2], limestones [3], shellfishes [4], etc. The greatest amount of calcium is limestone. Limestone is an inorganic mineral with the main constituent is calcium. The content of calcium carbonate ($CaCO_3$) in limestone is around 95% and the content of calcium carbonate in limestone can be purified to get calcium. That's why, limestone can be applied directly to various applications such as clinical, medical.. for the development of biomaterials and it is very suitable to be applied to hydroxyapatite.

Nowadays, scientists conduct researches on limestone to be an alternative in medical as a substitute for human bones damaged, limestone contains a lot of calcium (in the form of $CaCO_3$ (Calcium Carbonate), very close to the nature of human bones namely hydroxyapatite [5]. Known the compound composition of limestone minerals ($CaCO_3$) are Ca = 40.04%; C = 12.0%; O = 47.96% or CaO = 56.03%; CO_2 = 43.96.

There are various methods to make hydroxyapatite which can be clarified into a dry method, wet method, high-temperature process, biogenic and their combinations. From all of these methods, the chemical precipitation method is the most popular one. The chemical precipitation method is one pur

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