

<별표 제8호>

해외출장복명서

인사부서	담당	팀장

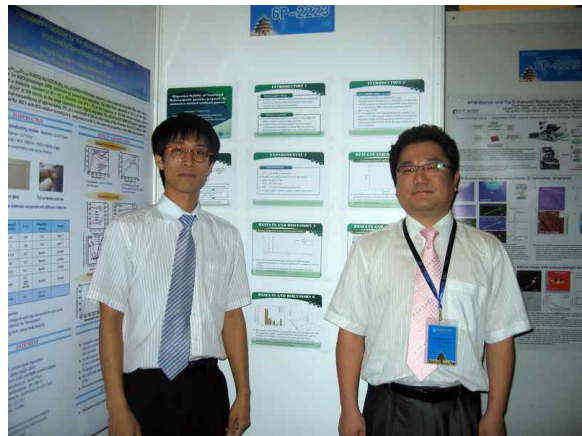
복명부서	담당	팀장	본부장	소장

소속	연구총괄팀	직급	팀장	성명	김종훈 (인)
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업무수행내용	<ul style="list-style-type: none"> ○ China NANO 2009 컨퍼런스 참가 ○ 'Dispersion Stability of Nano-sized Hydroxyapatite particles prepared via microwave assisted synthesis process' 논문 투고 및 포스터 발표 ○ Nanomedicine, Nanopharmacy and Biomedical Engineering 세미나 ○ Nanofabrication and Nanometrology 세미나 ○ Characterization of Nanostructures 세미나 ○ Modeling and Simulation of Nanostructures 세미나 <p>(유첨 ; <u>유</u>, 무) - 첨부 1: Conference 요약 및 사진 - 첨부 2: 발표자료 - 첨부 3: ChinaNANO 2009 Abstracts Book</p>				
자료수집내용	(유첨 ; <u>유</u> , 무)				
정책건의사항					

- ※ 1. 출장기간 등 변경 해당 시 당초 계획과 변경 후를 모두 기재
 2. 본 양식 부족 시 별지 사용

※ 첨부 1 Conference 요약 및 사진

- Nanopharmacy, nano sensor, nanometrology 및 biomedical engineering 등과 관련된 연구내용이 주를 이루고 있었음
- 특히, 기술의 발전과 함께 nanometrology, 즉 연구내용의 신뢰성확보를 위한 부수적인 기술개발에 대한 소개가 많았음
- 연구소 발표에 대해서는 최근 각광 받고 있는 microwave synthesis를 이용한 점에 대한 질문과 관심이 컸음



Dispersion Stability of Nano-sized Hydroxyapatite particles prepared via microwave assisted synthesis process

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INTRODUCTION 1

Hydroxyapatite (HAp)

- Recently, hydroxyapatite ($\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$) has been considerably focused as an attractive biomaterial because of their unique properties and excellent biocompatibility.

Microwave synthesis

- It is well known that microwave synthesis is a fast, simple and efficient method to prepare organic materials.
- Compared with conventional method, microwave assisted synthesis has the advantages of rapid heating rate, reduced processing times, and substantial energy saving. Moreover, it is environmentally cleaner.

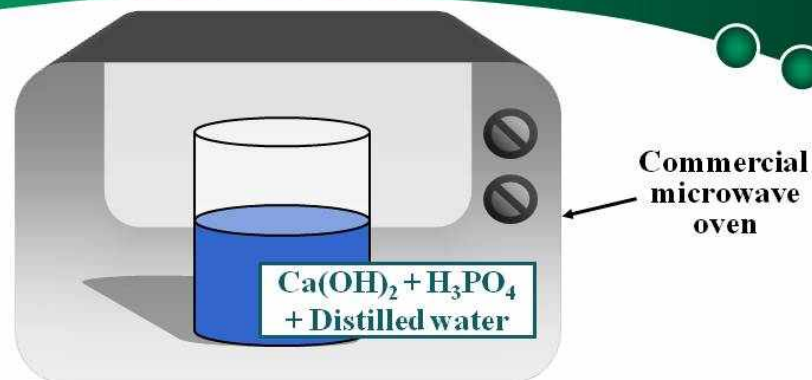
INTRODUCTION 2

In this work

- The as-prepared HAP were confirmed by using thermogravimetric analysis (TGA), wide-angle X-ray diffraction (WAXD), scanning electron microscope (SEM), energy dispersive X-ray spectroscopy (EDX), and fourier transform infrared spectroscopy (FT-IR).
- For the application of the HAP, their dispersion stability is very important. The main purpose of this research is to investigate the dispersion stability of HAP prepared via microwave assisted synthesis process as well as to search the proper solution for the afterward process.

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EXPERIMENTAL 2



① Microwave synthesis
(800W, 2.45GHz, 1h)

② Centrifuge
(6,000rpm, 30min)

③ Pouring out the supernatant

④ Evaporate water in oven
(60°C, 24hrs)

⑤ Grinded in the mortar

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EXPERIMENTAL 3

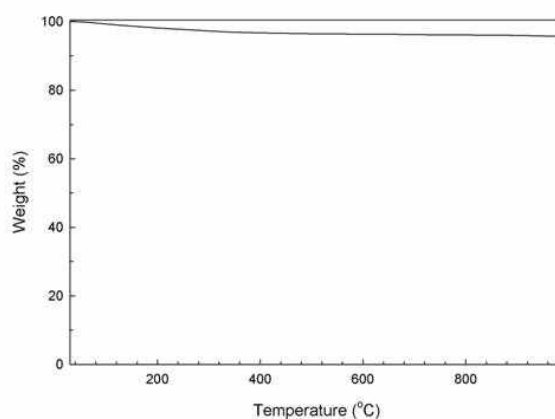
Characterization

- TGA : TGA Q 500, TA Instrument
- WAXD : X-ray diffractometer, D/MAX-2500, Rigaku
- EDX : Voyager2, Noran
- TEM : JEM-2010, Jeol
- BET : ASAP 2010, Micromeritics Instrument
- Dynamic Light Scattering : ZetaSizer, Malvern Instrument

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RESULTS AND DISCUSSION 1

Thermogravimetric analysis (TGA)

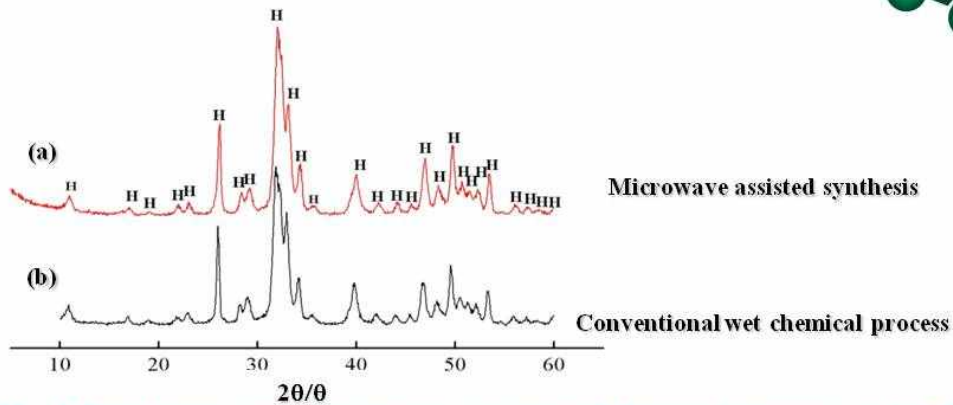


- The change of mass could be attributed to the partial removal of physically absorbed water and possibly lattice water.
- It could be inferred that some inorganic compounds were made by microwave assisted synthesis.

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RESULTS AND DISCUSSION 2

Wide-angle X-ray diffraction (WAXD)

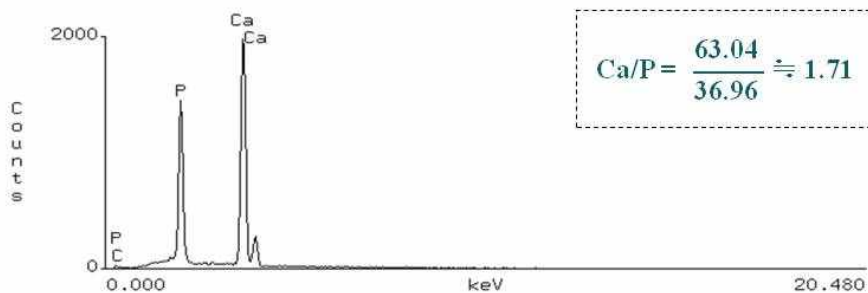


- The diffraction peaks of inorganic compounds from microwave assisted synthesis are almost similar to those from conventional wet chemical method.
- In agreement with the characteristic diffraction peaks of HAp (JCPDS 9-432), we conjecture that the inorganic compounds from microwave assisted synthesis can be HAp.

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RESULTS AND DISCUSSION 3

Energy dispersive X-ray spectroscopy (EDX)

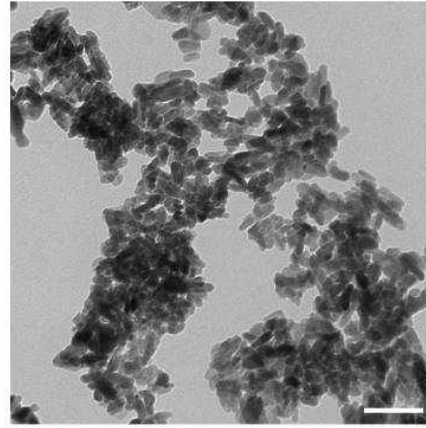
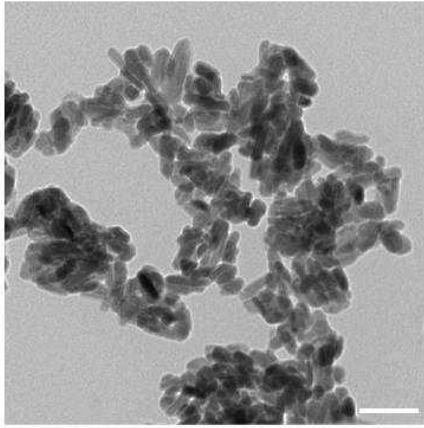


- EDX analysis shows that the molar ratio (Ca/P) of the inorganic compounds from microwave assisted synthesis is 1.71, compared with 1.67 in theory.
- Therefore, it can be speculated that the inorganic compounds from microwave assisted synthesis is HAp.

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RESULTS AND DISCUSSION 4

Transmission electron microscope (TEM)

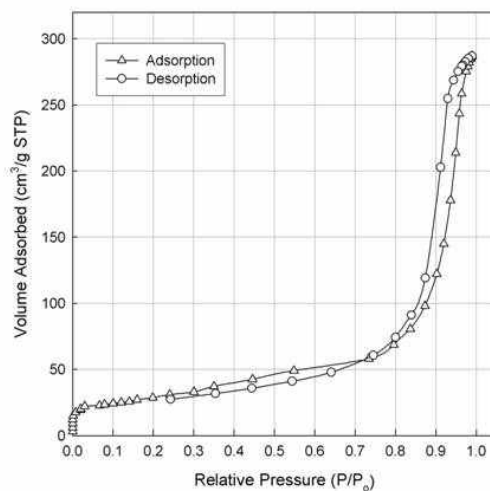


- These TEM photographs indicate the fact that the nanocrystalline HAP particles prepared by the microwave assisted synthesis has rod-like shape of 80-93 nm in length with a diameter of 8-14 nm (scale bars: 100 nm).

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RESULTS AND DISCUSSION 5

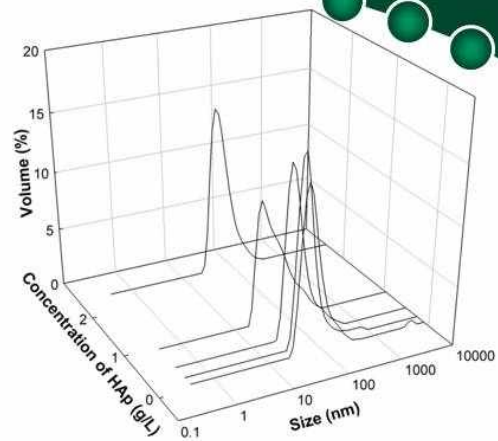
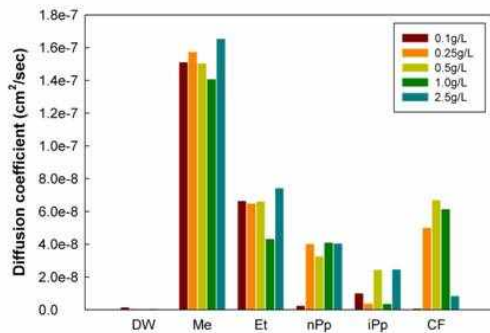
BET Analysis



- This isotherm shows the hysteresis loop indicating that it is the type IV in BDDT system with the presence of mesoporosity.
- It was found that the BET specific surface area and adsorption average pore diameter were $94.3 \pm 0.6 \text{ m}^2/\text{g}$ and 18.8 nm, respectively.
- Compared with the early reported, it seems that this powder has high specific surface area, relatively.

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RESULTS AND DISCUSSION 6



- DLS analysis shows that the HAp particles dissolved in methanol have the best dispersion stability, compared with other liquids including such as distilled water, ethanol, n-propanol, i-propanol and chloroform.
- Moreover, it can be speculated that the HAp particles from microwave assisted synthesis are composed nano-scaled and narrow particle size distribution due to fast homogenous nucleation.

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CONCLUSION

- It was concluded that microwave assisted synthesis of hydroxyapatite with calcium hydroxide and phosphoric acid could be a considerable process to prepare the nano-sized hydroxyapatite.
- This facile process can be suitable to prepare the nano-sized hydroxyapatite to be applied in some medical fields since there are no by-products that cause side effects.
- The HAp particles dissolved in Methanol have the best dispersion stability as well as were composed nano-scaled and narrow particle size distribution due to fast homogenous nucleation.

Acknowledgement

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