



Production of Super Absorbent Ceramic Material for the Industrial Paint Industry

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As a result of virus and bacterial effects such as the COVID-19 pandemic, the entire society is protected from the risk of virus and bacterial contamination by trying to act in accordance with mask, cleaning and distance rules. In addition, various diseases occur as a result of air pollution, where industrial wastes are also effective. It is very important to ventilate, clean and maintain our environments. As we are in contact in many places today without realizing it, environmental diseases can occur. Although the use of antimicrobial and antibacterial agents, where the chemicals used in the industrial paint sector may also have defense properties against viruses and bacteria, have been preferred in recent years, many paints are used as classic wall paints with their moisture retention, moisture prevention and aesthetic properties. In this study, bioceramic isolated from natural sources was obtained as a super absorbent that can be targeted to be used in the industrial paint industry.

Keywords: *Virus, bacteria, industrial paint, super absorbant, natural source, bioceramic*

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1. Introduction

Today, the field of science that many developments such as the industrial paint industry have is biomaterials. Biomaterials are materials that can be natural or synthetic, which can replace tissues and organs that cannot function in living systems, or repair their damage. In today's world, as diseases and injuries increase, the demand for repairs in cartilage and bone tissue has increased. In this sense, studies have been carried out for many years about the

interactions between biomaterials and tissues. Biomaterials are reclassified

as metal, ceramic, polymer and composite materials. Having high biocompatibility, hydroxyapatite (HA) is a bioceramic material that can be obtained directly from natural skins such as bones and teeth, or as a result of the reaction of unnatural materials such as egg and mussel shells with phosphate compounds [1-3].

Although HA bioceramic material is used for medical purposes in the health sector due to its high biocompatibility, it is also frequently preferred in filtration applications due to its absorption properties. However, when absorbent HAs were investigated, applications where their absorption capacity might be insufficient were encountered. Although the most common use of these absorbent materials is on masks, cosmetics and dirty water treatment in filtration applications, trial studies continue in the industrial paint sector. Today, many industrial paint producing companies make serious investments in R&D and production studies in their production. However, many of these studies are insufficient. Absorbents, when added to paints, provide defense against viruses and bacteria in the environment and prevent their adhesion, while minimizing air pollution in the environment thanks to their absorption capabilities. However, there is no commercially available super absorbent today. However, due to the increase in needs, the need for such paint products is increasing day by day, especially in our country. In addition, interior and exterior paints are produced in poor quality, which is vulnerable to moisture and can prepare the ground for the formation of bacteria and insects. Since the price of paints that try to prevent moisture, pollution, insect and bacteria formation is high, it cannot be at the level that the whole society can afford [1-6].

For this purpose, in our study, HA was synthesized from mussel wastes and our patented product, which will provide super-absorbing feature on HA synthesized by hydrothermal method, was coated homogeneously and an industrial dyeing agent with super-absorbent feature was produced.

2. Material and Method

Bioceramic synthesis and production of super-absorbent material coated with patented product

After the mussel shell wastes were obtained from the fishermen around us, they were washed in tap water and cleaned in pure water for two hours by means of an ultrasonic bath. The oil was removed by treatment with NaOH. Calcium carbonate (CaCO_3) ratio was determined by thermal gravimetric analysis (TGA) and processed with orthophosphoric acid (H_3PO_4) and sintered at $850\text{ }^\circ\text{C}$ for 4 hours. With our patented device, our polymeric matrix composite membrane was obtained. The obtained membrane and HA bioceramic materials were turned into composite super absorbent material by hydrothermal device [2-5]. Bioceramic synthesis from mussel wastes Figure 2.1. and our product produced with our patented device is shown in Figure 2.2.



Figure 2.1. Bioceramic synthesis from mussel waste

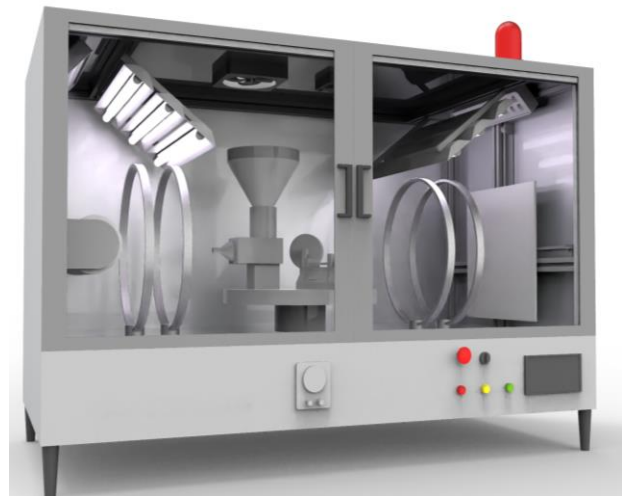


Figure 2.2. Our product produced with our patented device

3. Results and Discussion

With our patented device, as a result of the force effect from the polymer solutions, the membrane to be coated around the HA bioceramic in the hydrothermal device was obtained and the morphological fiber structure was observed by taking its image with a microscope [1-7]. Figure 3.1. shows the membrane, morphological fiber

structure and nanoparticle image obtained by hydrothermal process obtained with our patented device.

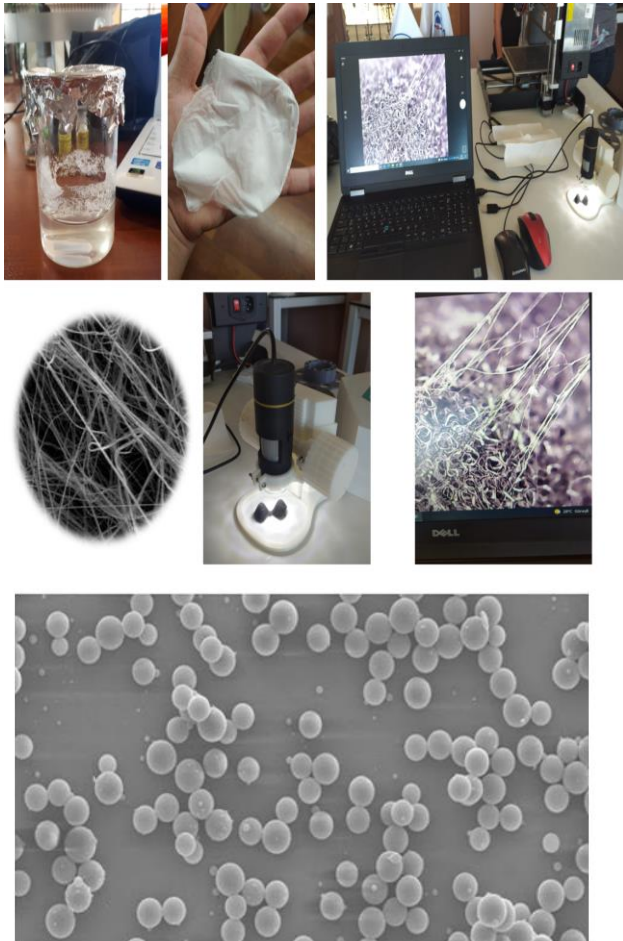


Figure 3.1. Membrane, morphological fiber structure and nanoparticle image obtained by hydrothermal process obtained with our patented device

4. Conclusion

Membrane was successfully obtained with our patented device and morphological fiber structure was revealed by microscope. Fiber diameters were found to be in the range of 150-300 nm. With the hydrothermal process, the membrane product HA was brought into the form of nanoparticles with super absorbent properties by covering it homogeneously around the bioceramic. A new generation commercial product has emerged that will prevent the formation of viruses, bacteria and insects by giving super absorbent properties to industrial paints.

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