

# A Study on the Combination Characteristics of Polyvinyl Chloride (PVC) and Natural Scoria Powder

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## 폴리염화비닐(PVC)수지 및 자연 화산석분의 결합특성에 관한 연구

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### Abstract

Polyvinyl chloride (PVC) is a thermoplastic with excellent acid resistance, alkali resistance, drug resistance and oil resistance. Therefore, it is widely used in pipes, artificial leather, records, packaging materials, electrical insulators, floor materials. As one of the cheap plastics with excellent performance, PVC has been widely concerned all over the world, and various industries consume a large amount of PVC every year. According to the statistics of the global PVC pipeline market sector, it is estimated that PVC will increase from 22.5 million tons in 2021 to 29.7 million tons in 2027, with a compound annual growth rate of 4.47% from 2022 to 2027. In addition, PVC is one of the most commonly used thermoplastic materials in global polymer consumption. Globally, the demand for PVC exceeds 35 million tons per year, ranking second only to polyethylene in the plastic industry [1]. The large consumption of PVC will inevitably lead to the generation of waste materials, which will lead to a series of environmental pollution. Generally, waste plastics are disposed by burying and burning. Although this method can deal with a large number of waste materials, the pollution to water, soil and air during burial and incineration is huge. The recycling of waste plastics is divided into mechanical recycling and chemical recycling. Mechanical recycling refers to the method that waste plastics are first made into pellets, and then new products are made through injection molding, extrusion, compression molding and other processing processes. Chemical recycling is a method that uses heat, additives, catalysts, etc. to polymerize or convert waste plastics into small molecular chemicals suitable for other petrochemical engineering or fuels. For example, the heavy oil, diesel oil and gasoline can be prepared through cracking and gasification, hydrogenation, thermal decomposition and other processes. Therefore, it is necessary to develop a new technology that can reuse PVC and improve its own properties. On the other hand, PVC has excellent corrosion resistance, so it is almost semi permanent when buried underground as a water pipe. However, if it is used for a long time, some microorganisms and other bacteria will be produced on the inner wall of the water pipe. Therefore, it is necessary to develop PVC materials with antibacterial properties. Jeju Scoria with many micropores, which is solidified by lava when Jeju volcano erupted about 1.2 million years ago. Natural scoria powder has good adsorption, deodorization and antibacterial properties, which have been confirmed by many researchers [2].

In this study, in order to study the combination characteristics of PVC resin and natural scoria powder as well as their antibacterial properties, the PVC resin and natural scoria powder were dissolved in dimethylformamide solvent according to a certain mass ratio. The morphology and the crystal structure were investigated by scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS), X-ray diffraction patterns (XRD) and Fourier transform infrared spectroscopy (FT-IR).

### References

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