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Influence of rock pore structure on the protective coating against weathering

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Tuff is rich in color and is used as a stone material, and it is also a rock that forms a unique landscape in Japan, a volcanic country. However, since it is generally a fragile rock, it is susceptible to weathering and deterioration. The present study conducted an experiment to confirm the effectiveness of the surface protectant using tuff with different physical characteristics. Sodium sulfate aqueous solution was used to determine the effectiveness of protective agent application for 5 types of tuff (Oya stone, Nikka stone, Ashino stone, Tatsuyama stone, Towada stone) An experiment was conducted in which the lower 3 cm of a 5 cm × 5 cm × 15 cm specimen that had been oven-dried at 110 ° C was immersed in a salt solution, and 20 ° C-40 ° C was repeated for up to 20 cycles in a 48-hour cycle. When the weight and P-wave velocity of each specimen were measured every cycle, the solution reached the surface of the uncoated stone material for comparison, salt crystals were deposited. The surface of the specimen was peeled off, and the P-wave velocity gradually decreased. On the other hand, in the stone material coated with the protective agent, salt crystallization was not observed even when the solution reached the top surface shortly after the start of the experiment. The P wave velocity did not decrease, despite cracks occurred as the experiment progressed. As a result, the P-wave velocity began to decrease and the surface layer fell off. In Ashino and Tatsuyama stones, the coated specimens were more severely destroyed than the uncoated specimens. In Oya stone and Towada stone, which contain clay minerals (miso) in the form of patches, crushing proceeded from the miso part. This experiment suggests that the effect of the protective agent may depend on the rock structure and the pore diameter. In other words, for rocks containing miso, the use of a protective agent is likely to increase deterioration regardless of the pore structure. For rocks with a large proportion of micropores and low durability against salt weathering, the use of a protective agent is used. Therefore, the start time of surface exfoliation can be delayed. In addition, in rocks with a large proportion of large gaps (> 10-0.5 μm), even if crystallization occurs on the surface of the specimen. The peeling does not occur for a while, but the protective agent penetrates deep into the thick protective agent penetration area. It is considered that the crystallization of the salt occurs more internally and the deterioration is more severe than it should be.