Stabilization processing and microbial control of tsunami damaged documents

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Purposes

Stabilization processing has brought a considerable amount of knowledge and techniques concerning the recovery of tsunami damaged cultural properties. Many institutions and experts have been engaged in primary and secondary salvage activities. In this study, we focused on microbial control of tsunami damaged documents, such as odor emanating from the treated paper documents during stabilization processing. We also considered water potential for more effective and simple stabilization processing. The stabilization processing is tailored to meet the situation through trial and error.

Background

The Tohoku region, Northeast Japan, experienced a gigantic earthquake and a subsequent tsunami. The disaster severely damaged cultural properties in unprecedented ways. However, no established methods existed at the time for applying stabilization procession to large amounts of tsunami damaged cultural properties. Stabilization techniques applied to tsunami-damaged objects made from different materials, basically consist of sterilization, dirt removal, and desalination. These techniques were developed and implemented by many specialists.

Materials and methods

Stabilization processing refers to the work performed to ensure that materials damaged by the tsunami could be stored stably for a long period of time. The basic steps were as follows: ①Mud removal in a dry state ②Disassemble the document into each sheet of page ③ Immersed in neutral detergent (24h) ④Desalination (Immersed in water 24h) x several times. The length of treatment varies depending on the chloride ion concentration of the damaged object. ⑤Drying. The treated water at the end of the treatment process was collected, frozen and defrosted. The number of bacteria present in the sample was counted with the dilution plate media method. After thawing the treated water sample, it was diluted with sterile water, and 0.1 mL was applied to 90 mm diameter standard agar medium (SA) and cultured at 30 ° C for 7 days. The number of bacteria per 1 mL of treated water was calculated from the number of appearing colonies (average value), and part of it was commissioned.

Water potential was measured with three samples immersed in water for 1 hour, 3 hours, 1 day and 3 days (text book printed in German, 1892, magazine printed in Japan, 1943 and

copy paper).

Results and discussion

The number of bacteria was shown in Fig. 1. In the process using the detergent, the tendency to decrease the number of bacteria was common to all treatment times. There were also cases where the number of bacteria increased in the second desalting rather than the first desalting. On the basis of this result, some improvement was given to the stabilization processing; treated water was exchanged in the morning and evening; the step of immersed in a pH neutral detergent (3h) put into the first step. As a result, the number of bacteria per 1 mL of treated water drastically decreased and the time required for desalination could be shortened.

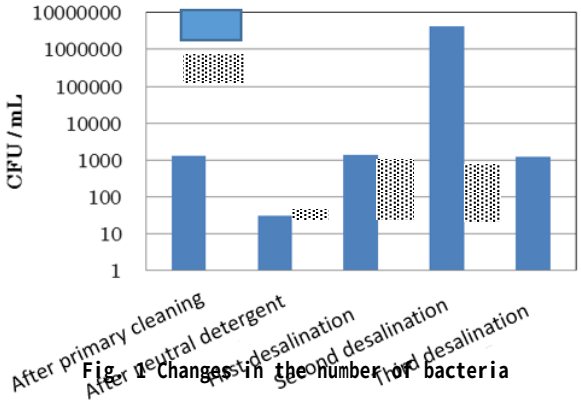

Fig. 1 Changes in the number of bacteria

The result of water potential measurement is shown in Fig. 2. There was almost no difference in moisture characteristics between copy paper and old Japanese magazines. On the other hand, the absolute value of water potential of textbooks printed in German was lower than above mentioned objects. Since an old paper has the problem of acid paper and the paper itself is also fragile, it is considered that it is better for the immersion to be shortened.

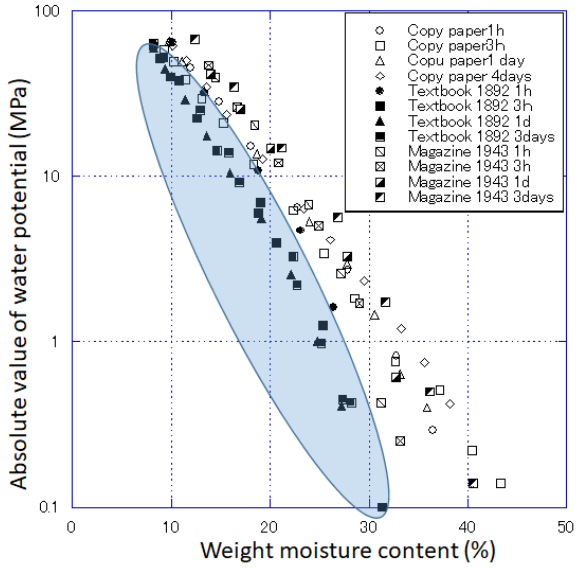

Fig. 2 Water potential of copy paper, textbook in 1892 and magazine in 1943

The stabilization processing is adjusted on a case by case on site and improved with experimental results. 8 years after the disaster, approximately half of the salvaged cultural properties have finished stabilization processing. Simple, more efficient and more effective methods should be researched in the near future.

【Acknowledgements】The authors are very grateful to Dr. Hideo Akanuma (Iwate Prefectural Museum) for his contribution of our study.