

Erosion Protection System by Salt Additives

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Many troubles of soil erosion are emerging in the cold area of Hokkaido where soil layers freeze and melt several times alternately in Winter and Spring thawing. For preventing the soil erosion we tried to make a resistant soil structure by addition of Calcium ion. The effects for erosion protection, slope soil conservation were evaluated by the slaking test by the measuring of soil particle dispersion ratio. The experimental site is selected at the upland field after consolidation in Abashiri, Hokkaido.

The alternative process between freezing and melting of the standard remolded sample were carried out in the laboratory. One cycle consists of 17 hours freezing time at -35 centigrade and 7hours melting time at +20 centigrade respectively. The 3 types of experiments were made by the addition of CaCl_2 solution, $\text{Ca}(\text{OH})_2$ solution and the mixture of $\text{Ca}(\text{OH})_2$ powder into soil samples. The dry soil of 100mg mixed with Ca ion of 200mg is called here by the name of Sample200, and so on.

1) The effects of CaCl_2 addition in the form of solution to the soil samples: There are no significant differences between sample 0 and Sample25, but Sample50 and Sample100 shows to be resistant against slaking that means low erosivity. Sample50 is not resistant when the alternative process is beyond 5 cycles. Sample100 is more resistant than Sample50 in low cycles (until 3 cycles), but less resistant in high cycles than others. Sample50 seems to be best among others.

2) The effects of $\text{Ca}(\text{OH})_2$ addition in the form of solution to the samples : Sample0 is worst in erosivity. Sample50 and Sample100 are resistant but decreasing gradually with the number of cycles increasing. Sample200 shows generally better resistivity than other treatments, though it decreases at 12cycles.

3)The effects of $\text{Ca}(\text{OH})_2$ mixed in the form of powder to the samples: Sample50 to 200 show high resistivity except the low range of 1 to 3 cycles.

4) As the results among three types of experiments, it can be suggested that the effects of $\text{Ca}(\text{OH})_2$ mixing in the form of powder to the samples will be the best way because mixing is easy comparing others treatment to handle to increase the erosivity as well SS (suspended solid) decreasing occurred by particle coagulation.

5) Salt Additives can be more effective in combination with other erosion prevention facilities like settling pond and filter drainage system which traps soil particles out of slope erosion.

The effect of freezing on the pF curve is the same as that of drying. This experimental result shows us that the soil structural change will be occurred by expansion and shrinking of soil volume during thaw season. Ca addition makes effect to lower the freezing point of soil water as well as to tighten the soil structure.