Experimental study on the Ecological Slope Protection with Aqueous Polymer Soil Stabilizers

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An Overview

- Introduction
- Soil stabilizer
- Laboratory test
- Field test
- Conclusion

Introduction

- The weak water stability and erosion resistance of soil frequently leaves the slope surface on highways, railways easy to soil erosion during rainfall conditions

The clayey soil slope of highway in Nanjing, Jiangsu Province, China

- **The chemical modification of the soil with soil stabilizer is a new way to improve the soil. Recently Soil stabilizer has been developed in many countries such as Japan, USA**
- **Most of soil stabilizers were used to modify the strength of soil, but the erosion resistance of their modified soil is not enough to protecting the slope surface during the rainfall.**
- **The modified effect is related to the soil and stabilizer type**
- **In this study, a new type of soil stabilizer, namely STW, which was developed for improving the clayey soils and protecting the slope surface, is introduced**

STW Soil Stabilizer

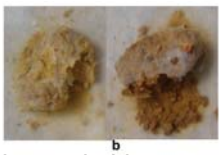
- A new type of aqueous polymer emulsion prepared using acetic-ethylene-ester polymer
- Physicochemical properties

Specific Gravity: 1.05 PH: 6-7 Viscosity: 3000mpa.s

Lab tests

Water stability

a



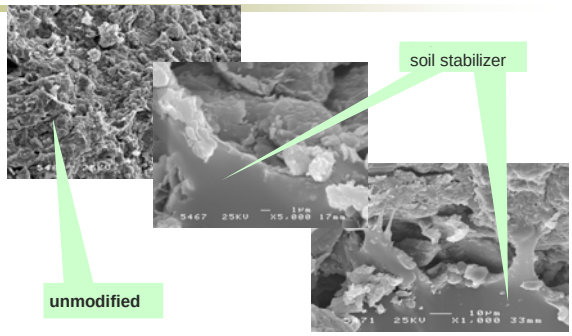
b

a、Unmodified soil aggregate immersed in water (1min)

b、Modified soil aggregate immersed in water (1 hour) – 10% of STW

Environmental-friendly type

Mechanism (SEM)



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- When soil stabilizer is applied to soil surface, it creates the physicochemical bonds between polymer molecules and soil aggregates through ionic, hydrogen, or Van der Waals bonds, which change soil properties and polymer solution dynamics.
- Through these bonds, long-chain polymer molecules enwrap the aggregate's surface and fill up the pore to form a membrane structure on the soil surface, and then improve the water stability and erosion resistance

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Field test

Clayey soil
Liquid limit: 52.6%
Plasticity index: 19.7

The clayey soil slope of highway in Nanjing, Jiangsu Province, China

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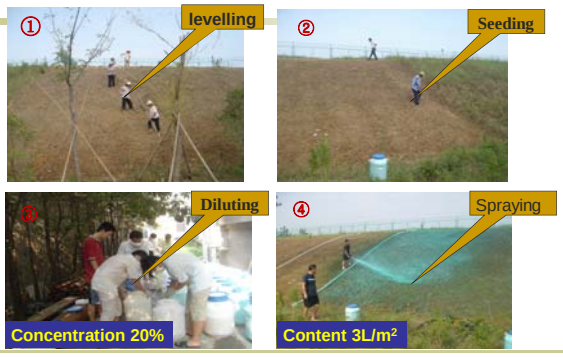
Construction procedure



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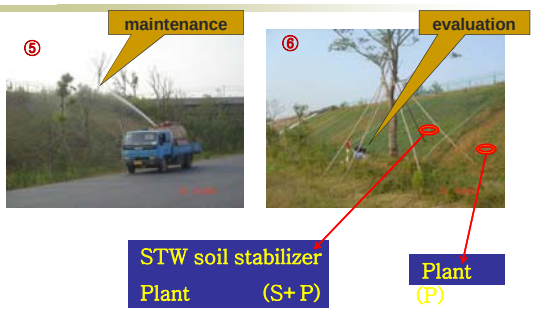
Construction procedure



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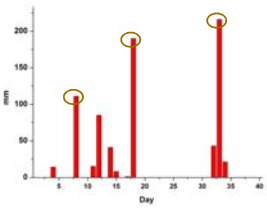
Weather condition

August 28 to September 7 (40 days after spraying)

Daily rainfall in Nanjing area



3 times >100

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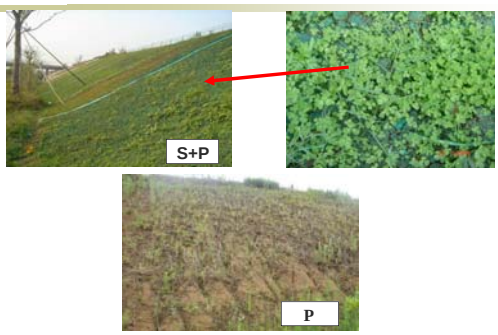
40 days later



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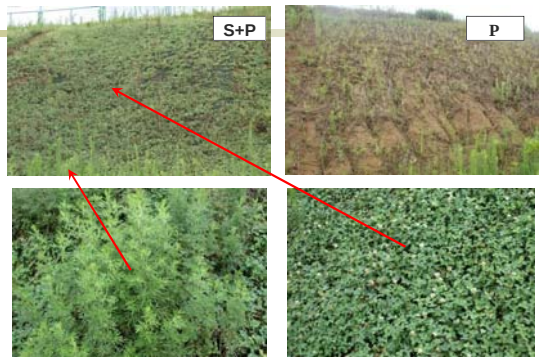
10 months later



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Conclusions

- STW is a new environmental friendly type of soil stabilizer to improve the water stability and erosion resistance of clayey soil
- The slope surface modified with STW soil stabilizer and plant had no gully, and the plant was well growth
- The ecological slope protection with soil stabilizer is an effective method to reduce soil loss and improve the stability of the soil slope

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Thank you for your attention

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- Specific gravity is around 2.7

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sample	immersing time（min）										Stability K%
	1	2	3	4	5	6	7	8	9	10	
S-0(0%)	17	20	28	32	47	50	50	50	50	50	**11.5**
S-1(3%)	1	1	2	4	5	5	6	9	11	11	**90.1**
S-2(5%)	0	0	0	0	0	0	1	3	5	7	**97.5**
S-3(7%)	0	0	0	0	0	0	0	0	1	1	**99.7**
S-4(9%)	0	0	0	0	0	0	0	0	0	0	**100**

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Staining Test

- The various color sample can be made from STW soil stabilizer