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TDS

pH

pH

pH

pH

.PS, SAR, TDS, DC

Effects of pH Value of Inflow Fluid on The Elector-Osmotic Treatment of Dispersive Soils

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Abstract

Dispersive soils dilute as colloids when they are exposed to water. The most important characteristic of these soils is presence of a large amount of Na ion in their pore water. Electro-osmosis is one on of the electro-kinetic phenomena in which the liquid moves relative to the solid phase under the influence of an externally applied electrical potential. This causes the positive ions move from anode towards cathode; following which the moisture content and TDS value of the soil near by the anode are decreased and it is highly treated to become non-dispersive. At cathode, however, the dispersivity become even worse. These phenomena initiates several physical and chemical changes in soil which are appreciated in the current paper. This paper presents results of a laboratory research program in which the pH value of the inflow fluid, and in some cases also outflow fluid, at anode and cathode, are changed and their effects on the efficiency of the electro-osmotic treatment of test specimens are evaluated. It was observed that the soil is best treated when the inflow and outflow fluids are acidic and base respectively. As the treatment proceeds the current density decreases due to the increase of soil electrical resistance When the ultimate treatment has been achieved the pH value of the soil at anode and at cathode decreases and increases, respectively. In the same time the plastic and liquid limits increase both at anode and at cathode. However, this effect is more eminent at anode.

Key words: Dispersive Soil, Electro-osmosis, Electro-kinetics, DC current, TDS, SAR, PS.

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- DC

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.PS , SAR

$$SAR = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}}$$

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$$PS = Na / TDS \quad , \quad TDS = Na + K + Mg + Ca$$

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K , Na , Mg , Ca

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. [] SAR > 2

TDS > 1

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PS < 40 , 40 < PS < 60 , PS > 60

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(B)

(A)

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pH

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Test No	Current mA/cm ²		P	Fluid pH		pH	Ion content, meq/lit.				TDS meq/lit.	PS%	SAR
	Initial	Final		Init.	Fin.		Ca	Mg	Na	K			
Initial Soil	-	-	-	-	-	7.0	0.9	1.9	50.8	0.5	54.1	93.9	36.3
1	0.7	0.4	+	7.0	3.7	7.2	1.9	3.4	30.4	0.6	36.3	83.8	18.8
			-	7.0	12.5	8.1	0.6	0.5	45.2	0.3	46.6	97	61.0
2	0.7	0.3	+	2.9	3.6	7.3	2.5	6.1	19.1	0.6	28.4	67.3	9.2
			-	7.0	12.4	8.2	0.8	0.8	29.1	0.3	31.1	93.9	32.5
3	0.8	0.4	+	11.3	4.4	7.3	2.5	6.1	28.5	0.9	38.3	74.5	13.5
			-	7.0	12.5	8.3	0.3	0.5	34.8	0.3	35.9	96.9	55.0

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Test No	Current mA/cm ²		P	Fluid pH		pH	Ion content, meq/lit.				TDS meq/lit.	PS %	SAR
	Init.	Fin.		Init.	Fin.		Ca	Mg	Na	K			
Init. Soil	-	-	-	-	-	7.0	0.9	1.9	50.8	0.5	54.1	93.9	36.3
4	0.7	0.1	+	7.0	4.0	6.2	6.8	10.8	1.2	1.0	19.8	6.1	0.41
			-	7.0	12.9	9.4	0.2	0.2	38.5	0.7	39.5	97.4	99.4
5	0.8	0.1	+	2.9	4.2	6.1	7.5	11.2	1.1	0.8	20.5	5.5	0.37
			-	7.0	12.9	9.2	0.1	0.1	52.5	0.9	53.6	98.0	166.1
6	0.8	0.2	+	11.3	4.0	6.0	9.7	5.6	1.2	0.8	17.3	7.0	0.44
			-	7.0	13.0	7.5	0.3	1.0	16.3	0.5	18.1	90.0	20.2
7	0.8	0.1	+	2.9	4.5	6.5	6.7	8.3	0.7	0.8	16.5	4.2	0.26
			-	11.3	12.8	8.8	Nil	1.0	25.0	0.7	26.7	93.8	32.4
8	0.9	0.1	+	2.9	4.5	6.6	4.1	3.9	15.2	0.8	24.0	63.2	7.58
			-	2.9	12.6	8.1	0.1	0.5	51.8	0.3	52.7	98.2	94.6
9	0.8	0.2	+	10.0	4.2	6.7	6.3	10.4	6.3	0.9	23.7	26.4	2.2
			-	7.0	12.8	9.4	0.1	0.1	30.7	0.9	31.7	96.8	108.4

Test No.	Current mA/cm ²		P	Atterberg Limits %			A/B	Test No.	Current mA/cm ²		P	Atterberg Limits %			A/B
	Init.	Fin.		LL	PL	PI			Init.	Fin.		LL	PL	PI	
Base soil	-	-	-	33	14	19	21.8	5	0.8	0.1	+	38	16	22	1.52
											-	34	15	19	94.9
1	0.7	0.4	+	36	22	14	11.2	6	0.8	0.2	+	38	18	20	2.2
			-	39	18	21	92.2				-	33	15	18	70.3
2	0.7	0.3	+	36	21	15	6.2	7	0.8	0.1	+	37	14	23	1.5
			-	37	19	18	91.2				-	34	15	19	98.8
3	0.8	0.4	+	36	18	18	7.03	8	0.9	0.1	+	39	18	21	5.9
			-	37	16	21	93.9				-	37	16	21	93.7
4	0.7	0.1	+	37	18	19	1.55	9	0.8	0.2	+	41	15	26	3.5
			-	34	16	18	90.4				-	37	18	19	95.1

pH . ,pH = 2.9 -

pH /

pH /

pH /

/ pH % / gr/cm³ PVC

Ba(OH)₂ CH₃COOH mm mm PVC

pH mm

pH PVC

cm / cm []

(-) pH

(-) A/B pH

[] () pH

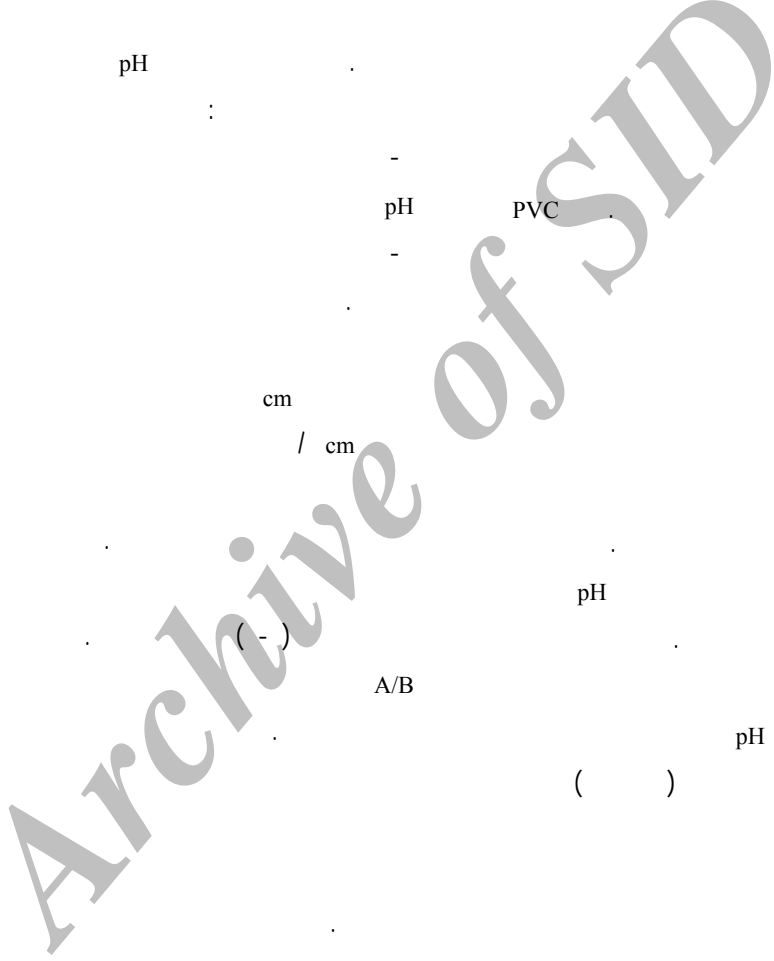
pH = 2.9

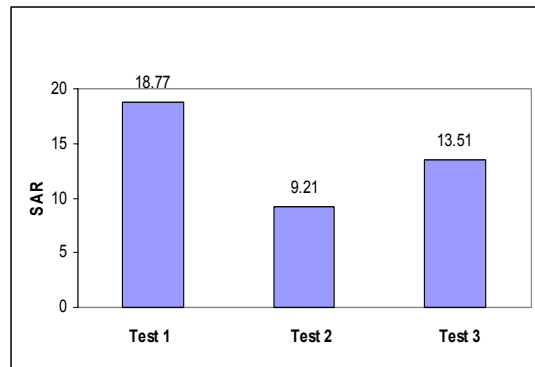
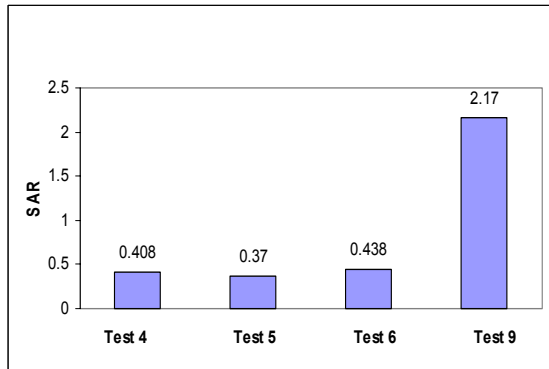
pH = 11.27

CH₃COOH

Ba(OH)₂

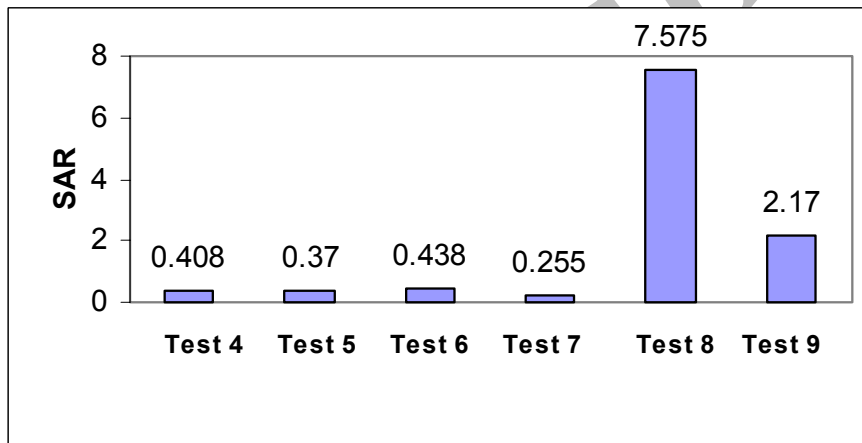
pH pH



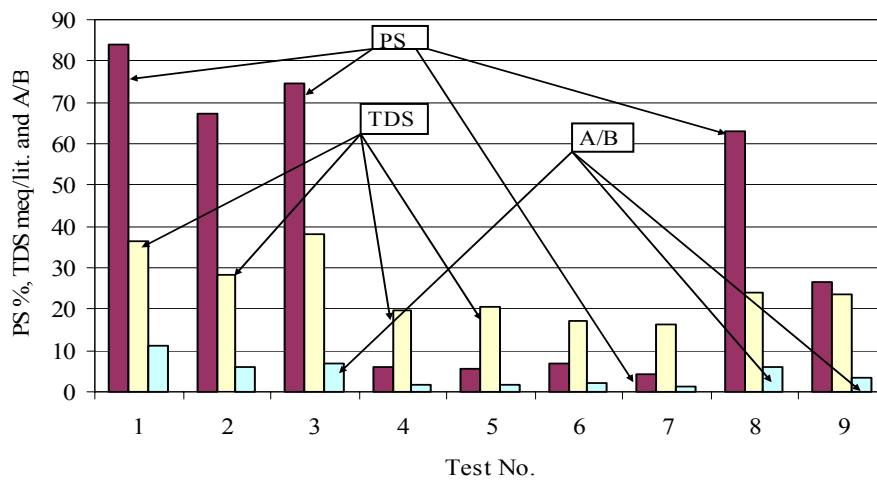


SAR -

SAR -



SAR -



A/B TDS PS -

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$$\text{TDS} = \text{Na} + \text{K} + \text{Mg} + \text{Ca}$$

pH

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