MEASUREMENT OF THE WETTABILITY OF ELECTROLYTES

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ABSTRACT

This article deals with the measurement of the wettability of electrolytes suitable for supercapacitors. Three electrolytes and three alkaline salts were used. The electrolytes must be a hihg wetting matherials because a matherial of electrode is poromeric.

1. INTRODUCTION

The wetting balance measures the vertical forces of buoyancy and surface tension as a test piece from polyethylene is immersed into a bath of electrolyte. The wetting force is converted by a transducer into an analogue signal. This signal may be taken onto an X/T recorder, or may be digitalised by a computer. The digital signal is used to generate the force-time curve, and is analysed to find the required forces and times from the force-time curve. At the figure 1 there is a non-wetting sample and at the figure 2 there is a wetting sample.

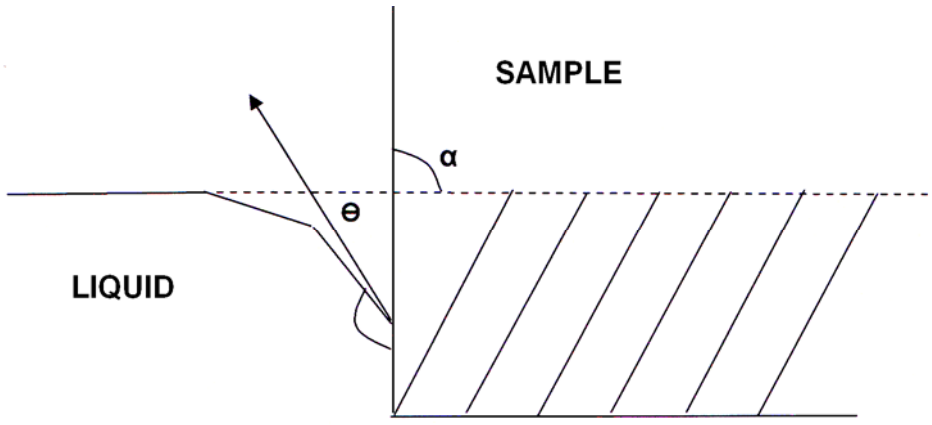

Figure 1: Non-wetting

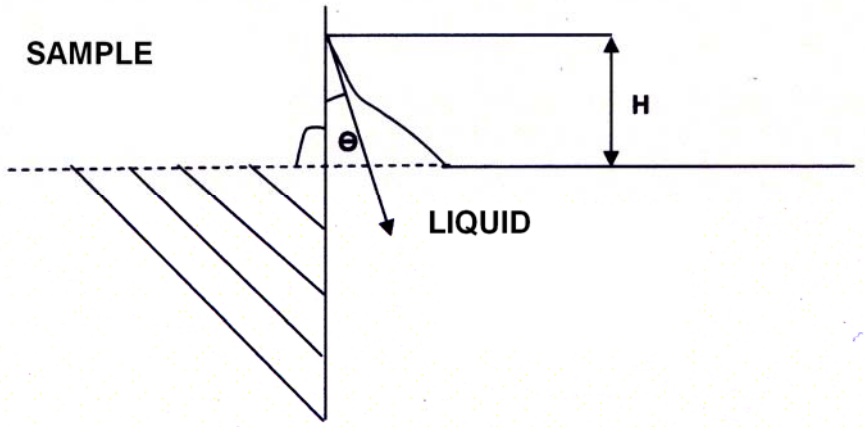

Figure 2: Wetting

2. EXPERIMENTAL

2.1. MATERIAL

Table 1 shows the tested electrolytes and their composition. Testing sample is polyethylene test piece with diameter 2.46 mm.

Sample number	Concentration	Salt	Solvent
3	1 M	$LiClO_4$	propylen carbonate (PC)
8	1.25 M	$NaClO_4$	propylen carbonate (PC)
18	0.75 M	$NaClO_4$	dimethyl sulfoxide (DMSO)
23	1 M	$KClO_4$	dimethyl sulfoxide (DMSO)
25	0.5 M	$LiClO_4$	diethyl carbonate (DEC)
41	0.5 M	$NaClO_4$	N,N dimethyl formamide
44	1.25 M	$NaClO_4$	N,N dimethyl formamide

Table 1: Tested electrolytes

2.2. INSTRUMENTATION

Meniscograph was used for wetting balance tests of electrolytes. In figure 3 there are steps of the test. Samples are fixed by special adapters. Adapters are draped on sensitive measu-

ring mechanism of test instrument. Investigated section of surface of sample wrapped up into liquid with constant temperature. Polyethylene sample was used for measurement. This method is defined for example by ČSN EN 60068-2-69, ČSN EN 60068-2-54, ČSN EN ISO 9455-16 and ČSN EN ISO 12224-3 [1].

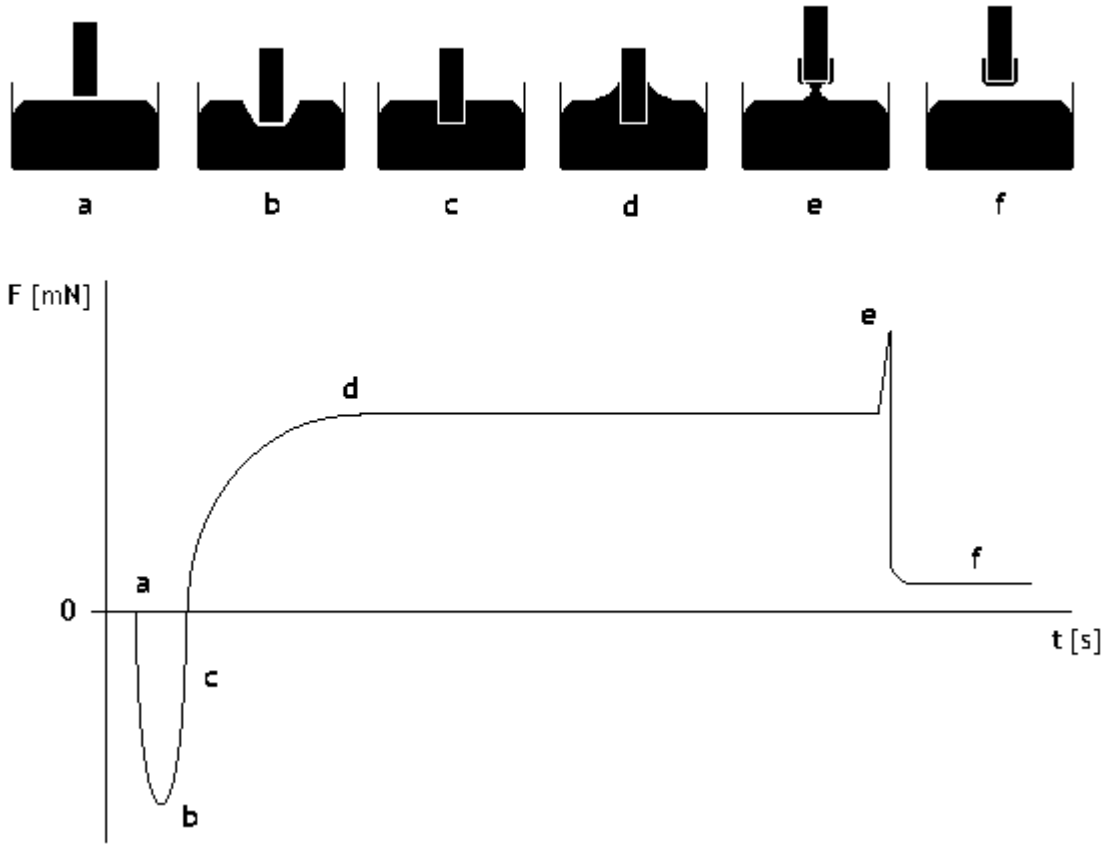

Figure 3 Steps of the measurement [1]

2.3. RESULTS AND DISCUSSION

Figure 4 shows the voltage - on - time dependence (force – 1 mV = 0.1 mN). Results of measurement of the best and the worst wettable samples are shown. Time 5000 ms was evaluating. Table 2 has results of the test.

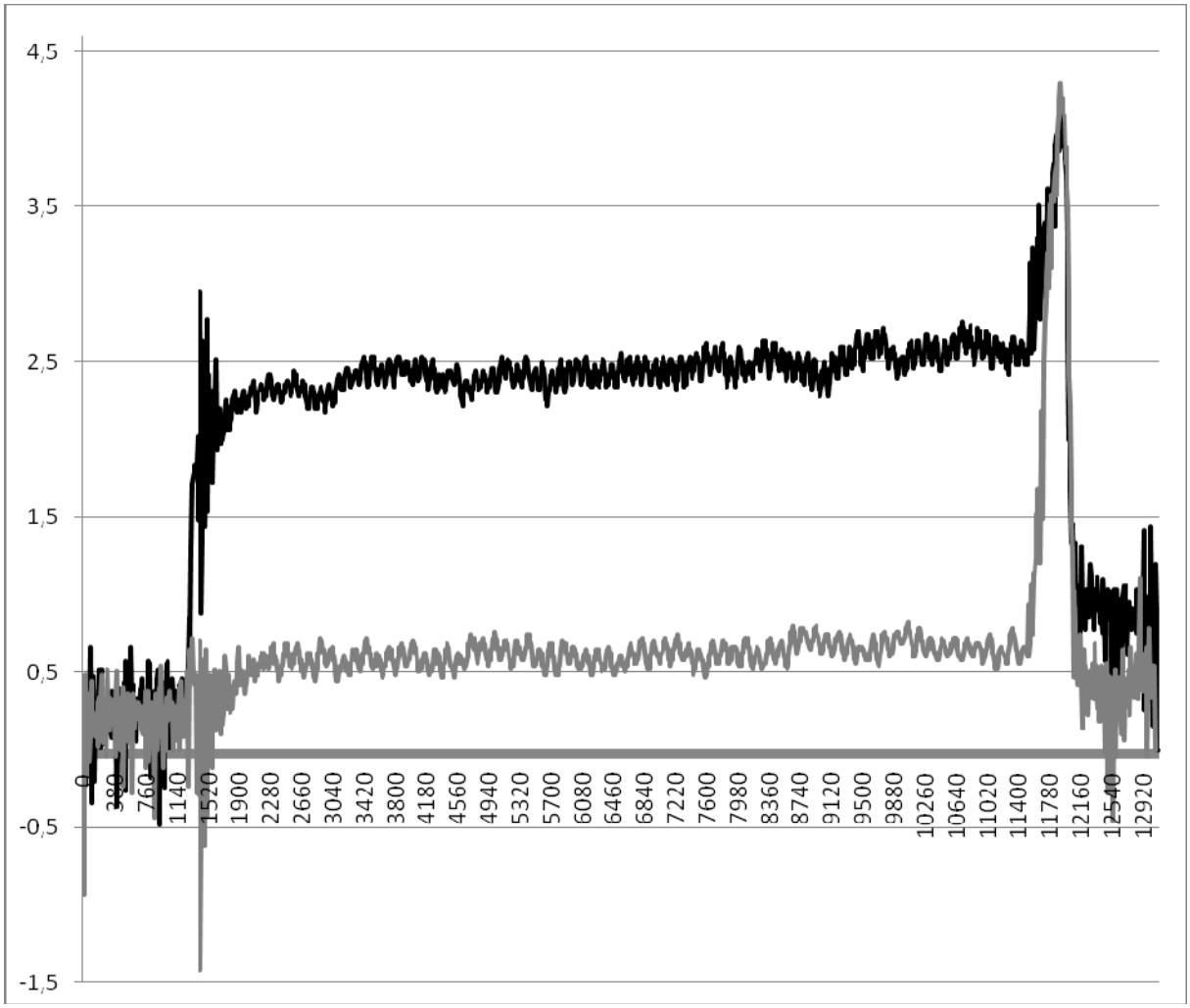

Figure 4: Voltage - on - time dependence

NO	03	08	18	23	25	28	41	44
Voltage [mV]	1.11	0.8	1.18	1.74	1.72	1.54	2.46	1.8
Force [mN]	0.111	0.08	0.118	0.174	0.172	0.154	0.246	0.18

Table 2: Results of testing

3. CONCLUSION

There are many materials suitable as electrolytes for supercapacitors. We are looking for material with high wetting force and ability to rise to poromeric material of electrode. This was the first test of electrolytes by wetting balance method. I would like to apply surfactants for better wetting without deterioration of capacity.

ACKNOWLEDGEMENT

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REFERENCES

[1] Harant, P., Steiner, F.: Testování pájitelnosti metodou smáčecích vah, Electroscope, 1/2007, ISSN 1802 - 4564