ELECTRODES FOR THE ELECTROCHEMICAL SUPERCAPACITORS

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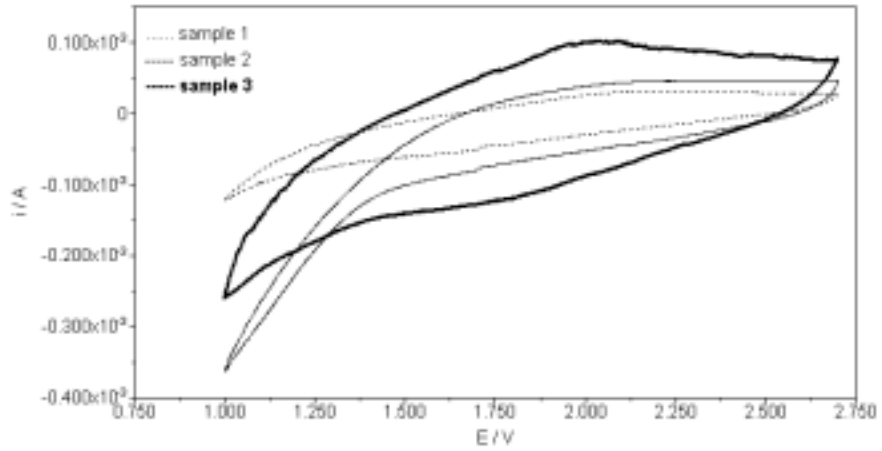
This work deals with the selection of additives and their ratio for the development of electrode for electrochemical supercapacitor.

Electrode consists of carbon, binding agent (acrylic dispersion Sokrat), conditioner (hydrogen ammonium carbonate) and metal a screen which is covered with this substance. From two types of carbon (graphite CR5 and expanded carbon supplied Bochemie Inc. Company) I chose expanded carbon. The electrode from expanded carbon exhibits better cohesion (it depends on the shape – Fig.1) than the electrode with graphite CR5 (Fig. 2) which after a couple measures crackled. Therefore, for the electrode with expanded carbon we can use less binding agent (Sokrat) and therefore decrease the resistance of the eelctrode. The binding agent is well miscible with water.



Starting potential : 1,7 V

sample 1 (Fig.3) – 0,111 g NH_4HCO_3

sample 2 – 0,130 g NH_4HCO_3

sample 3 (Fig.4) – 0,244 g NH_4HCO_3

Capacity for 2V		
		[mF]
sample 1		2,795
sample 2		4,560
sample 3		9,407

I investigated when I use more conditioner for the substance the capacity increases. You can see it on the chart (obtained as curves voltage vs. current by cyclic voltammetry). The three curvesdiffers in different quantity of the conditioner (hydrogen ammonium carbonate).

The capacity is calculated from the formula:

$$C = \frac{1}{2}\frac{\Delta I}{\alpha}$$

where C [F] is capacity, Δi [A] is difference of currents at anodic and cathodic branches and α [mV/s] is the scan rate (for this measurement 0.01[mV/s]).

All three measurements are made in

0,5 mol.l^{-1} → 2,66 g $LiClO_4$ + 50 ml propylen carbonate (99,7%).

Conclusions

Adding of a soluble substance such as ammonium hydrogen carbonate and subsequent leaching by water increased the porosity and therefore also the apparent capacity of the electrodes.

Acknowledgments

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Fig.1

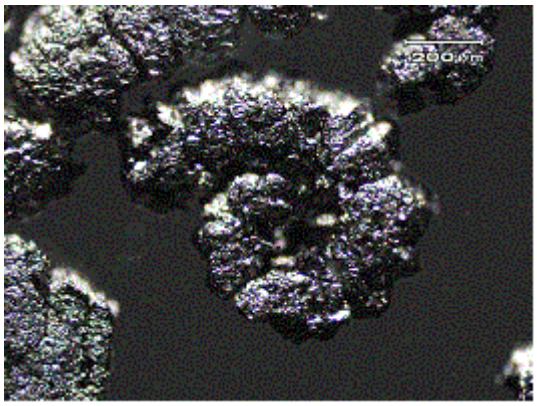

Fig. 1. *A typical particle of expanded graphite*

Fig.2

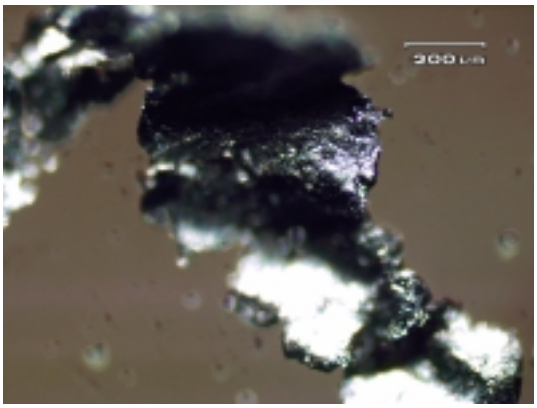

Fig. 2. *Typical particle of graphite CR 5 as received from graphite mine*

Fig. 3

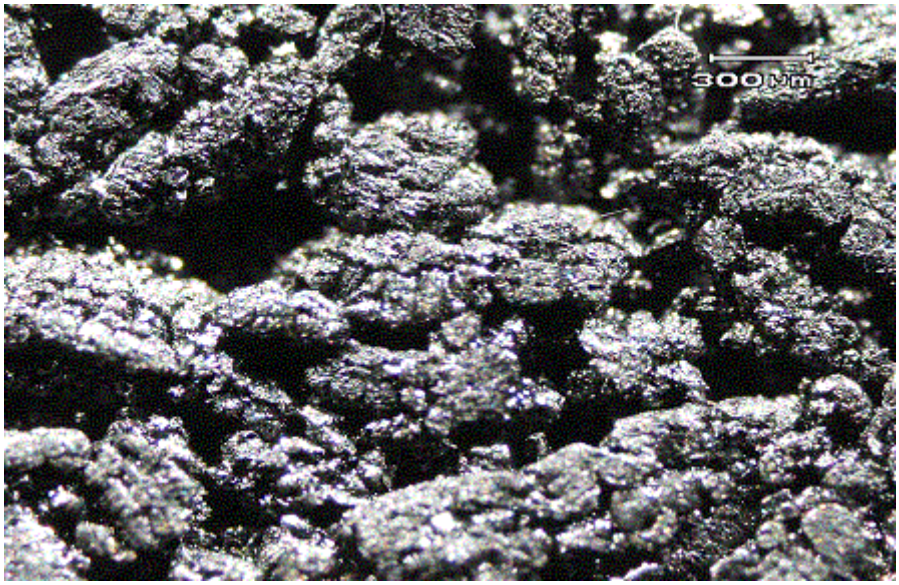

Fig. 3. *The electrode mass after removal of ammonium carbonate*

Fig.4