8. SPEEDOMETER

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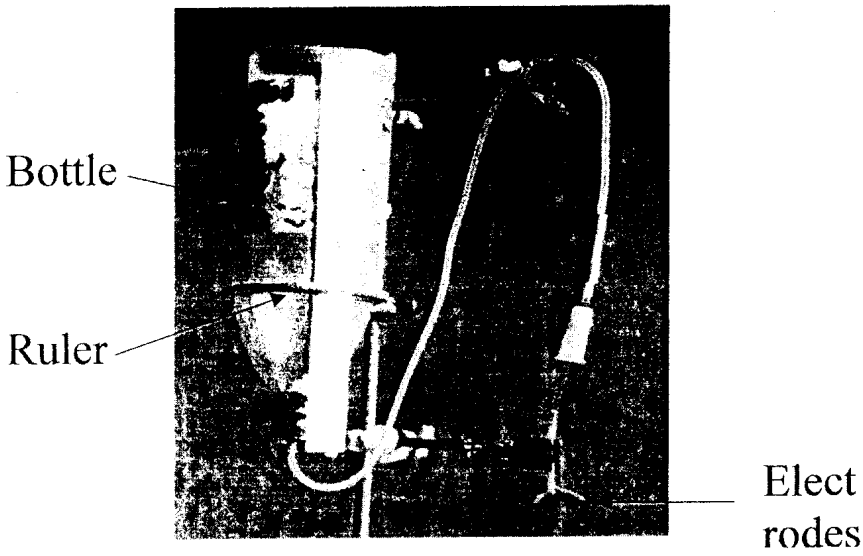
If we have two electrodes in electrolyte, than the potential difference appear.

To investigate dependents of potential difference on relative motion of electrodes the following experiment was made. It consists in following:

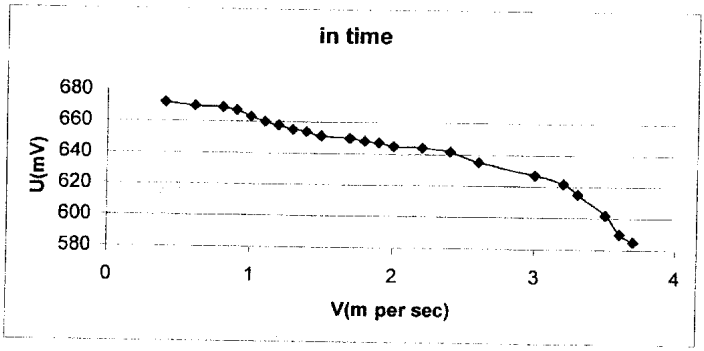


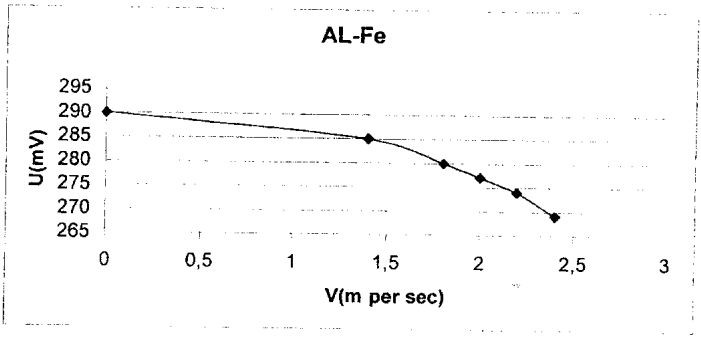
Bottle without bottom is fixed in turn over position on the stand. The thin hose which is raised up is fixed with it is one end to the neck of the bottle. Ruler is fixed on the side of bottle, such as the zero of ruler coincides with the neck of the bottle. Electrolyte is poured into the bottle up to the definite level which is maintained constant. We can change the speed of electrolyte's leak from the second end of the hose, in which electrodes are put. The change of speed is fulfilled with the help of raising up and lowering down of the second end of the hose. Potential difference is measured during the leak of electrolyte.

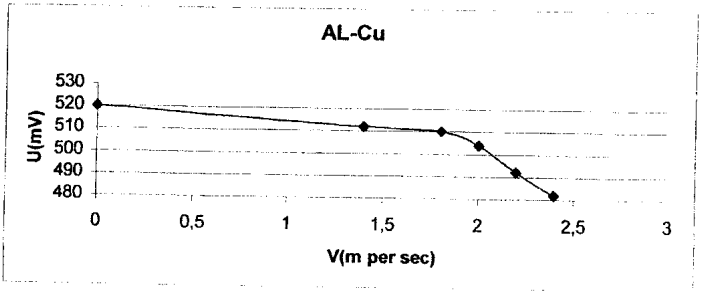
This experiment is notable because relative speed of electrodes is equal to zero,

But we can observe change of potential difference. In this case the potential difference is created by motion of electrolyte. If we pass into the reference frame relatively to electrolyte than electrodes will be in motion.

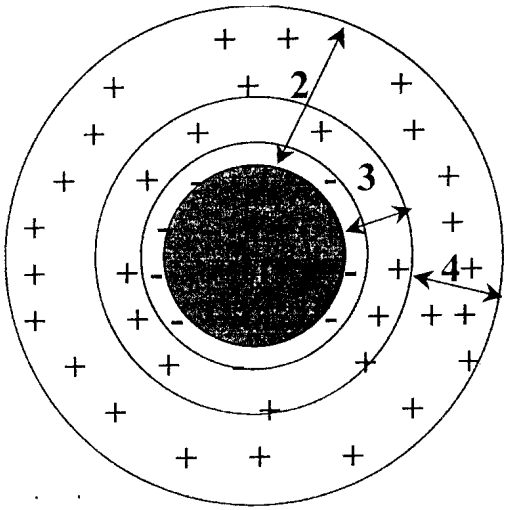
On this graph you can see how a potential difference for couple of any metals decreases by increase of speed.







By relative motion of electrodes or electrolyte the electrokinetic phenomenon appear. That is potential difference by displacement of one phase relatively to another appear. There is electric double layer on the boundary of two phases. It is a thin surface layer which consist of electric charges with opposite sign. Electric double layer is subdivided on dense and diffusive parts. Dense part consist of positive ions and negative ions. And diffusive part consist of the other positive ions. Washing of the electric double layer takes place in our experiment. The diffusive part of the electric double layer is mostly changeable, and this part is washed off in this case, and thickness of electric double layer decreases.



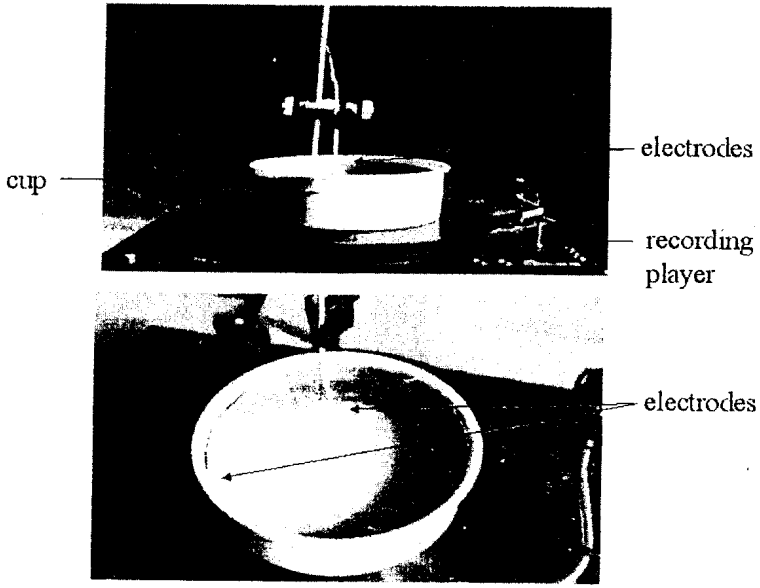
1 - electric

2 – electric double layer

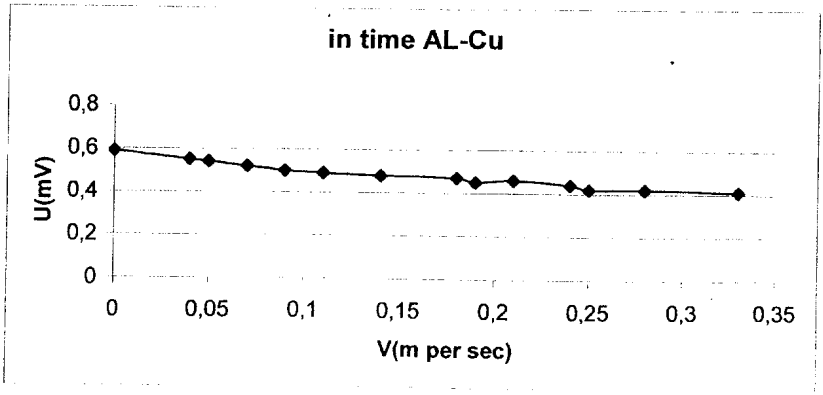
3 – dense part

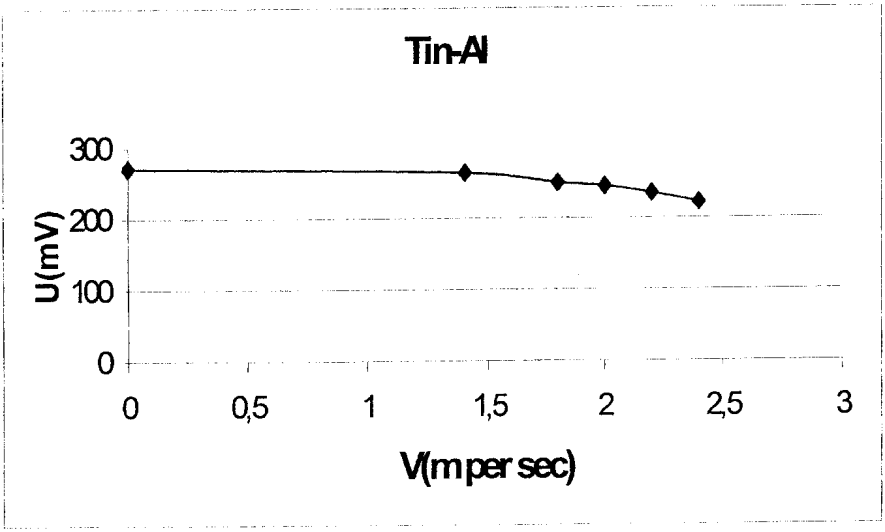
4 – diffusive part

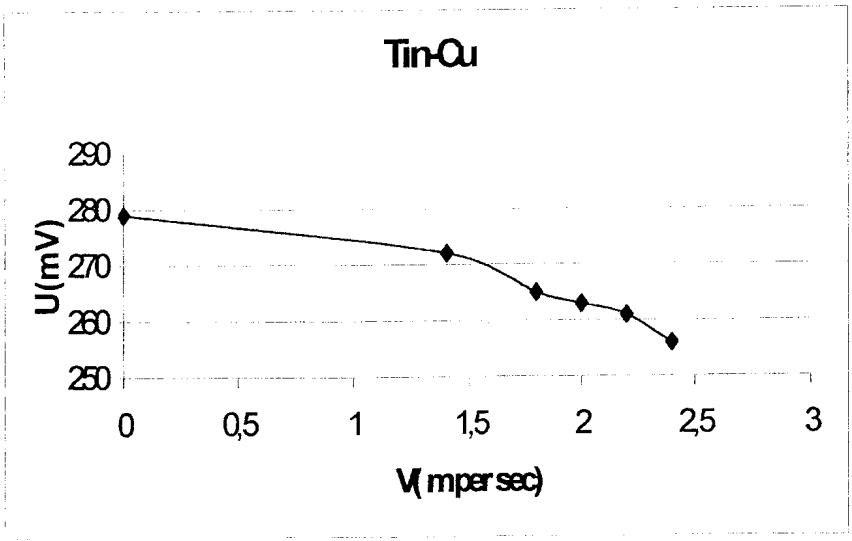
To investigate dependence of potential difference on the speed of relative motion of the electrodes and on their shapes the following experiment was made. It consists in following:



We have rotating platform on which the round plastic cup is placed. The copper plate, which is also electrode, is stuck by the perimeter of whole cup. The second electrode can be put into the cup with the help of the stand. During the experiment we can change speed of electrodes' motion. We can fulfilled it with help of cups with different radiuses. You can see the graphs of dependence of potential difference on the speed by different metals.




Tin-Al
300
200
100
0
U(mV)
0
0,5
1
1,5
2
2,5
3
V(m per sec)


Tin-Cu
290
280
270
260
250
U(mV)
0
0,5
1
1,5
2
2,5
3
V(m per sec)

Also I will show you what we got when we have different shape of electrodes.

		U(mV)	
AL	Cu	V=0.25(m per sec)	V1=0.35(m per sec)
w	plate	0,52	0,49
plate	plate	0,52	0,53
L	plate	0,54	0,51
U	plate	0,5	0,5
circle	plate		
R=6	plate	0,62	0,61
R=5	plate	0,57	0,56
R=4	plate	0,54	0,53
R=3	plate	0,52	0,51

At the conclusion I want to talk about electrolyte concentration. Positive ions transformed from the diffusive part to the dense part when the concentration of the solution increases and thickness of the electric double layer decreases. That is why the potential also decreases. At some concentrations of electrolyte all positive ions transformed to the dense part. And then we get that the potential is equal to 0. It is very difficult to fulfill it by the experiment.

Acknowledgement:

I would like to acknowledge Dr. T.Barnaveli for the very fruitful discussions of this problem.