CHZ 224 SURFACE AND COLLOID CHEMISTRY

EXPERIMENT #3: MEASUREMENT OF ZETA POTENTIAL

1. Introduction

Zeta potential is the charge that develops at the interface between a solid surface and its liquid medium. This potential, which is measured in MilliVolts, may arise by any of several mechanisms. Among these are the dissociation of ionogenic groups in the particle surface and the differential adsorption of solution ions into the surface region. The net charge at the particle surface affects the ion distribution in the nearby region, increasing the concentration of counterions close to the surface. Thus, an electrical double layer (EDL) is formed in the region of the particle-liquid interface.

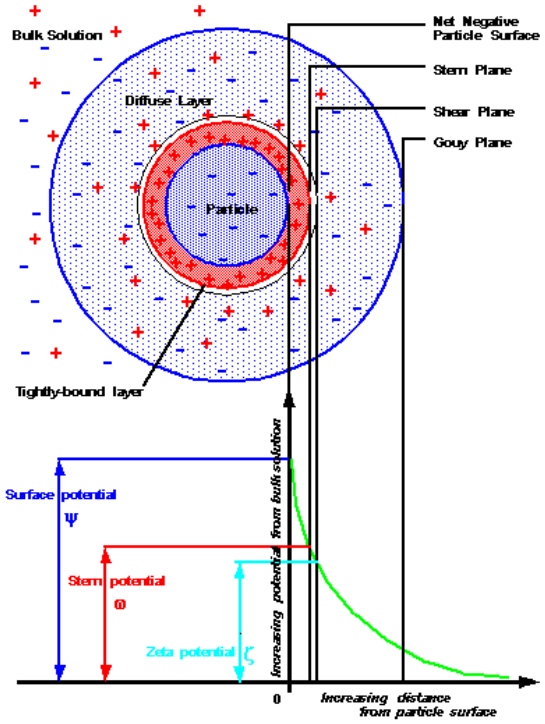

Figure 1. Schematic illustration of electrical double layer (EDL).

In an electric field, each particle and its most closely associated ions move through the solution as a unit, and the potential at the surface of shear between this unit and the surrounding medium is known as the zeta potential. When a layer of macromolecules is adsorbed on the particle's surface, it shifts the shear plane further from the surface and alters the zeta potential.

Zeta potential is therefore a function of the surface charge of the particle, any adsorbed layer at the interface, and the nature and composition of the surrounding suspension medium. It can be experimentally determined and, because it reflects the effective charge on the particles is therefore related to the electrostatic repulsion between them. The zeta potential has proven to be extremely relevant to the practical study and control of colloidal stability and flocculation processes.

2. Materials and Methods:

In this experiment, zeta potential measurements will be carried out with Zeta-Meter 3.0 unit using mica samples -53+38 μm in size in solutions of with different pH values as (5, 7 and 9).

3. Experimental Procedure

1. Carefully prepare the concentrations of salt solutions based on their molecular weight.
2. Weigh 0.01 g sample and add it to 100 ml solution. Then mix the solution for 3 minutes by using magnetic bar on a mixing unit.
3. Following the 2nd step, wait for 30 seconds in order to prevent the clodiness of solution which will have negative affect during zeta potential measurements.
4. Measure the pH of solution before measurements.
5. Take about 25 ml of solution and carefully fill the zeta-potential cell.
6. Insert the electrodes and check the position of light and measurement scale on monitor.
7. Measure the specific conductance of solution. Adjust the voltage and measurement scale from zeta-meter 3.0 unit
8. Energize the electrodes and watch the particles as they move accross a grid on your video display.
9. Track one particle by simply pressing a keypad button and holding it down while your colloid moves across the grid. When you release the button, your particle's zeta potential is instantly displayed.
10. After the measurements, cut off energy, pour out the solution to another beaker and measure the final pH of the solution.

4. Report

1. Write step by step how you performed the experiment.
2. List possible reasons for measuring zeta potential in a few sentences of your own words.
3. Comment on your results for each case.
4. What is the difference between zeta potential values in different salt solutions? What is the reproducibility of the tests?