Study on Interfacial Double Iayer Capacity

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As the total capacitance of a dropping mercury electrode increases with the drop growth, resonance can be observed at an instant in each dropping period by proper choice of a.c. frequency and load inductance. The differential capacity per unit interfacial area can be estimated from the consideration of the resonance and the interfacial area at this instant.

The shapes and positions of the capacity-bias voltage curves obtained depended specifically on the anionic species in solutions in zero as well as in anodic regions. The potentials of the peaks of humps occurring near a.c.m. were independent of the cationic nature, and had almost the same values for given anionic species except sulfates. The capacity values of humps followed the order of the polarizabilities of corresponding anionic species. These humps became less evident with dilution of solution, indicating that they were attributable to the properties of the non-diffuse double layer. Relations between log Ch and log γ in the case of halogens and log γ'_{12} in the case of halogenates showed linearity with positive inclination of about 1.7.

The capacity values in cathodic region were dependent on neither cationic nor anionic species in solutions, having almost equal values defined by the concentration of solution. From a simple model of electrostatic condenser, the effective dielectric constant of water between mercury surface and outer Helmholtz plane was calculated to be about 7.5, which was considered to be a proper value if we assumed the dielectric saturation in this layer.

Tendencies of capacity minima in zero region began to appear in more dilute solutions. This was quite in accord with the theory of double layer structure, because diffuse double layer capacity, which was in series to the non-diffuse double layer capacity, had the very property and began to affect the whole capacity value as the solution became dilute.

Theory and Application of U-effect

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When the double layer in a glass capillary is forced to vibrate mechanically, generation of a.c. voltage can be observed between its two ends, which we

call "*U*-effect I". In the case of glass-liquid interface we call it "U-effect I", and in the case of mercury-solution interfaces "*U*-effect II". The former is an effect of a.c. streaming potential generation and the latter is attributed to the periodical charging and discharging current of the interfacial double layer capacity.

U-effect is applicable to all sorts of mechano-electric transducers, and it was proved that the apparatuses applying it were equally matched to those of Rochelle salt. Moreover, with regard to resistance against humidity and temperature change or easiness of fabrication, which Rochelle salt lacked, our device was superior.

U-effect I can be used to measure streaming potentials by a.c. technique, which will provide more conventional method of its measurement by farther improvement.

Counter *U*-effect can be observed by interchanging the input and output terminals of the elements. This gives an electroacoustical transducer, although the efficiency is very small.

Electron Microscopic Studies on Alkaline Earth Carbonates. (I)

Formation by Carbonic Acid Gas Method

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Calcium, strontium, and barium carbonates were prepared by introducing bubbles carbon dioxide gas into their hydroxide solutions or suspensions. Mixed carbonates were also prepared from the mixture of the hydroxides. The pH of the reaction mixture was about 12.5 at the outset and was almost constant during the course of the reaction and decreased rapidly directly before the end of the reaction. The rate of the formation reaction of barium carbonate was measured by titration and the reaction seemed to be nearly zero-order. Generally speaking, the reaction velocity was independent of the concentration of hydroxide and decreased with decreasing concentration of carbon dioxide gas. The reaction velocity was minimum at about 30°C. When the reaction mixture was suspension before the reaction, the reaction velocity was dependent on the dissolution velocity of hydroxide and decreased with increasing content of calcium hydroxide. Formation of calcium carbonate in the presence of strontium or barium hydroxide occurred after that of strontium carbonate or barium carbonate.