

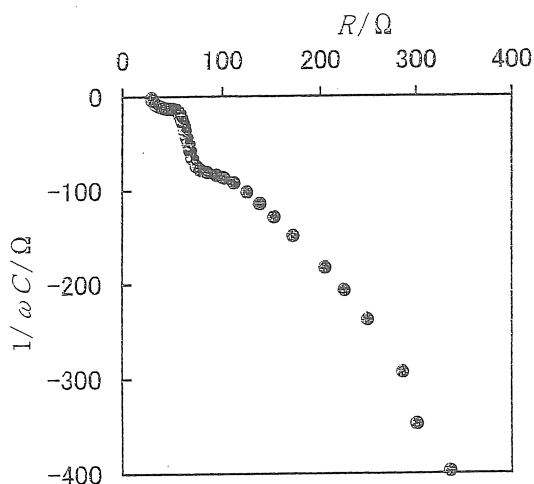
Research on the desalination mechanism in the electrically regenerative deionization process

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Summary

Electrically regenerative deionization process is a deionization method which combines the ion exchange resin with the electro dialysis technique, and produces highly purified water without requiring neither acid nor alkali to regenerate ion exchange resins. Though some ultrapure water production equipments based on this method are already in the practical uses, the exact mechanism of regeneration is unknown. Generally, the electric potential distribution and/or the ion distributions are measured by a using redox microelectrode or an ion-selective microelectrode, but careful attention should be paid to avoid dissolution of carbon dioxide in the air or inflow of ions from the microelectrodes. For the system sealed from the surroundings, it is impossible to apply the ordinal measuring technique. Then, the impedance measurements are adopted in this research.

The impedances were measured in a 1MHz-20Hz frequency range. First, it was confirmed that no electrode reaction occurs. In the figure is shown a Cole-Cole plot for the system equipping a mixture of anion- and cation- exchange resin. The straight line with a slope of 45° implies that the diffusion of ions is the rate-determining step, and the concentration gradient is formed in the interface between ion-exchange resin layer and the platinum electrodes. It was suggested that water dissociation may proceed in this region.



Cole-Cole plot for the system equipping a mixture of cation- and anion-exchange resins.