

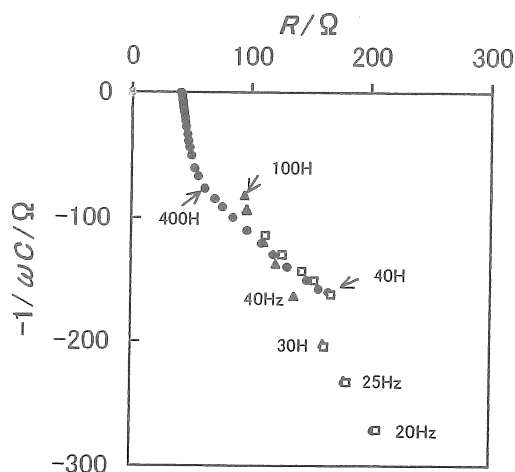
## Research on the desalination mechanism in the electrically regenerative deionization process

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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 using a 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. In the figure is shown a Cole-Cole plot for the system equipping Na-type cationic ion-exchange resin. In the diffusion-control region, a hysteresis was observed, which suggests existence of a positive feedback mechanism in water dissociation in the diffusion layer. As water dissociation plays an important role in the electro-deionization technique, the elucidation of the positive feedback may be the most important.



Cole-Cole plot of the impedance for the bed of Na-type cationic ion-exchange resin