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Study on performance of alkaline water electrolysis

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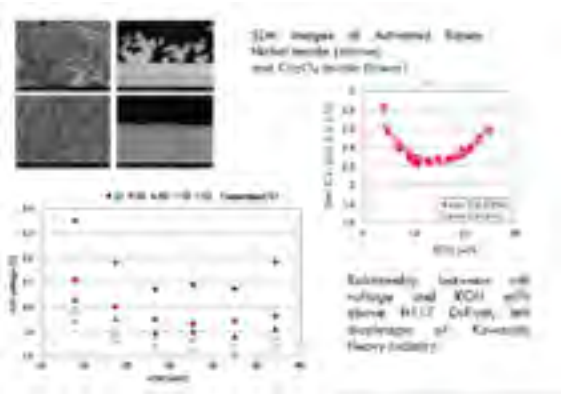
Global warming caused by CO_2 gas can no longer be ignored. Therefore, we are trying to contribute to reducing the problem with our electrolytic technology accumulated so far in our company. Our target is to develop a large of alkaline water electrolysis (AWE) plant with high performance and contribute to problem solving. The performance of AWE is largely classified and influenced by four factors of anode, cathode, separator and cell structure of electrolyzer. Here, the results of electrodes and separators are mainly explained in our evaluation. Considering the use of renewable energy as standard, electricity always fluctuates in the operation of AWE. Therefore, the components of the cell must be sufficient resistant to such fluctuations. Electrode: there are two types of activated coating to reduce the overvoltage of electrode. Our investigation revealed that the anode coating of thermal decomposition is not enough tough, but the dispersion electroplating such as Raney Ni showed good durability against 100 times shutdown. During the shutdown of operation, revers current pass through in the cell. The revers current deteriorates the electrode performance and the phenomena causes difficult for anode coating life. Each saving of anode oxygen overvoltage of thermal and electroplating is around 50 mV and 100 mV compared with bare Ni. Separator: In the AWE, electrolyte is the same in both anode chamber and cathode chamber, so that diaphragm instead of ion exchange membrane can be used as separator. The point of its performance is that low cell voltage and high purity gas can be obtained. Currently, AGFA and KHI diaphragm are considered to be applicable to large-scale AWE plants. The performance of our AWE plant was around1.8 V at 5 kA/m^2 and 80°C. Its performance is affected by the electrode to be used. The differences in cell voltage occur from 100 mV to 200 mV.



Biography

Akiyoshi Manabe is the General Manager of Water Electrolysis and Energy PJ team in De Nora Permelec Ltd. He finished his Master's degree from the Tokyo Institute of Technology. He has developed a new project at the forefront by Chlorine Engineers Corp. Ltd. His main development of technology is as follows: activated cathode coating (low hydrogen overvoltage) for chlor-alkali plan cell (1977-1981); Supercritical extraction of CO2 gas, especially extraction of top flavor from roasted coffee for can coffee (1983-1992); Lithium ion secondary battery with Canada Moli Energy, NEC and Mitsui & CO., Ltd (1992-1998); and Technology development of chlor-alkaline (1998-2010). In 2013, he started working at the De Nora Permelec Ltd., and his work focuses on the AWE plant technology and to promote business creation.

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